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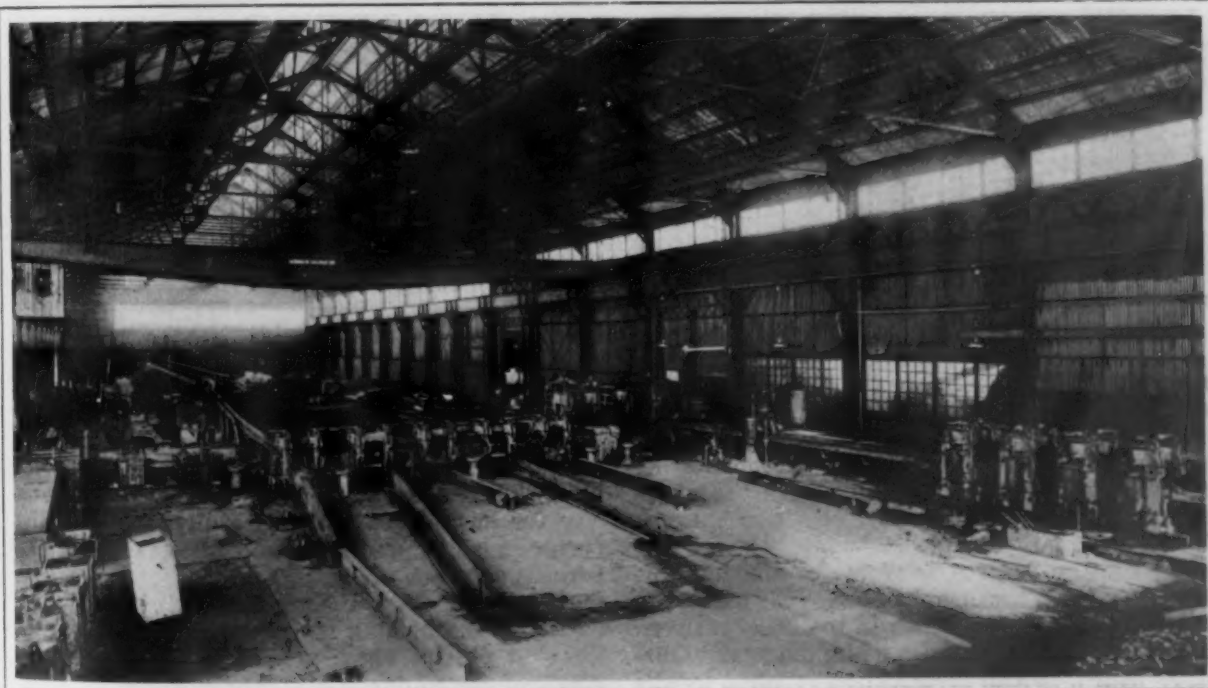
Wisconsin Steel Company's New Bar Mill

Continuous Reduction of a 4 x 4-in. Billet and Rolling to $\frac{1}{4}$ -in. Rounds Without Reheating—Extending the Capacity of the South Chicago Plant

Just at the close of 1913 the Wisconsin Steel Company completed and placed in operation at its South Chicago plant a new bar mill, designated as its No. 4 merchant mill. The previous mill capacity of the plant included a two-high reversing 35-in. blooming mill making billets down to 4 x 4 in., the No. 1 merchant mill rolling all of the bar shapes from $\frac{3}{8}$ in. up to $1\frac{1}{8}$ in. and the No. 2 merchant mill rolling bars from $1\frac{1}{8}$ in. up to $2\frac{1}{2}$ -in. rounds, together with flats, angles, zees and skelp. In order

from 4 x 4-in. billets without reheating. The arrangement that has been worked out accomplishes this, or, what is perhaps the more interesting fact, makes possible the reduction of a 5000-lb. ingot to $\frac{1}{4}$ -in. rounds with but one reheating.

The general layout of the No. 4 merchant mill as indicated consists of 14-in. roughing stands arranged for the continuous reduction of the billet, followed by two stands of 16-in. rolls which provide the medium of flexibility in the mill, five stands of a



The General View of the No. 4 Merchant Mill of the Wisconsin Steel Company. From Right to Left the View Shows Four Stands of 14-in. Rough, Two Stands 16-in. Belgian Mill, Five Stands of 12-in. Mill and Two Stands of 8-in. Mill with the Morgan Hot Beds in the Background

to fill up the full range of sizes, particularly in the smaller bars, and to provide capacity for rolling the special requirements of the International Harvester Company, leaving the other mills free for other specifications, a mill designed to roll down to $\frac{1}{4}$ -in. rounds and with sufficient flexibility so that small tonnages of any of these could be rolled with high economy became necessary. The limitations of the situation also included the fact that the blooming mill could deliver no smaller than 4 x 4-in. billets, which presented the problem of rolling $\frac{1}{4}$ -in. rounds

12-in. mill and two stands of an 8-in. mill on which the smallest sizes are finished.

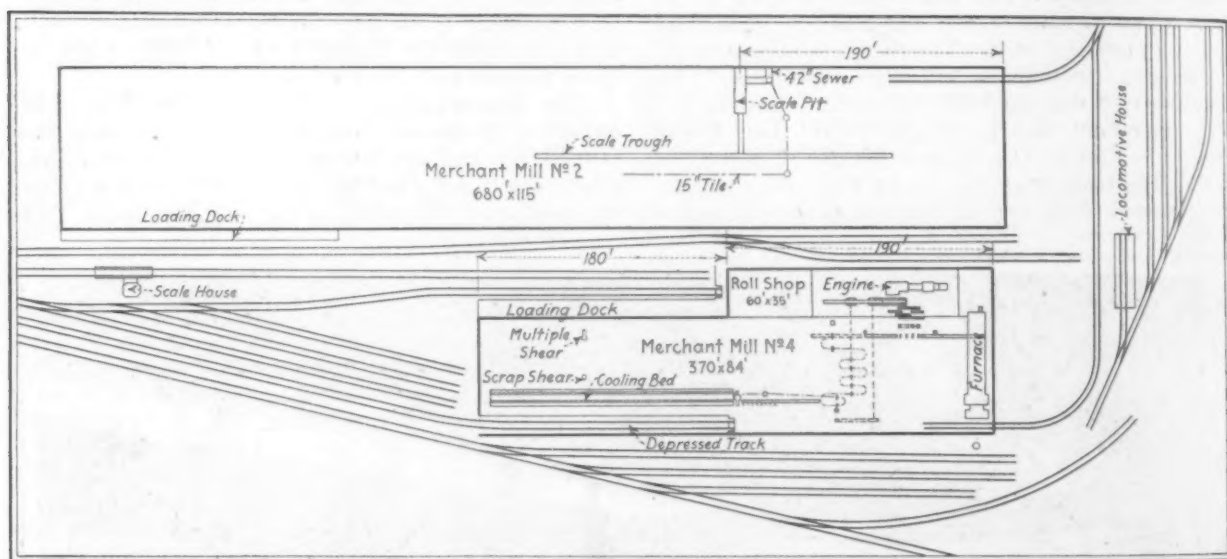
The complete reduction to $\frac{1}{4}$ -in. round is accomplished in 15 passes. This is made possible in large measure by the gearing ratio of the roughing stands which is arranged so that the continuous reduction made here breaks down the billet from 4 x 4-in. to $1\frac{1}{4}$ -in. oval in four passes. Four passes in the 16-in. stands accomplish further reductions as low as an oval for $7/16$ in. square; one pass through each of the remaining 7 stands completes the rolling.

Where skelp is to be rolled the material is finished on the 12-in. mill. The range of material to the rolling of which the mill must accommodate itself includes in addition to the wide variety of shapes already mentioned, some special shapes, including what is known as "harvester bar," which runs about 4.85 lb. to a foot and is equivalent to an angle shape with an additional leg. Some of the other sizes rolled on the mill include $\frac{3}{8}$ -in. small flats, wagon-box strips $\frac{3}{4}$ in. x No. 13 gauge, $\frac{1}{2}$ x 5/32-in. ovals down to 7/16 x 5/32 and 9/16 x $\frac{1}{8}$ -in. flats.

The original plan for the mill was based on an output of about 2500 tons, the idea being to install an inexpensive mill to roll the odds and ends. It quickly became obvious that the equipment required for the 2500-ton mill would in most respects be equally capable of handling 6000 tons if the mill were laid out on the latter basis, and at little or no additional expense. Except for certain limitations of space and shearing capacity the mill as it stands is therefore capable of rolling on double turn 6000 tons monthly, and has been installed at an exceptionally low cost for that capacity. The mill at present lacks a flying shear for cutting the finished

the furnace much closer to the fire bed than would otherwise be possible and continues the region of greatest temperature of the furnace in its normal location. A view of this end of the furnace is shown, together with the mill table which delivers to the roughing stands. The charging end of the furnace is also shown herewith.

The billets are transferred from the cars on which they are brought from the blooming mill by the 15-ton Alliance crane to the charging platform. The charging pusher is the full width of the furnace chamber so that the two rows of billets are moved along the skids simultaneously and in parallel. The furnace has been made unusually long, in part because of the firing arrangement and also in the natural endeavor to use the heat absorbed through as wide a range of temperature as possible. As a result a thorough and uniform heating of the billet is secured, which contributes materially, it is believed, to the exceptional reductions accomplished in a limited number of passes in the mill. The views of the furnace show the elevation at which it is built. This height was required primarily to establish a level affording sufficient



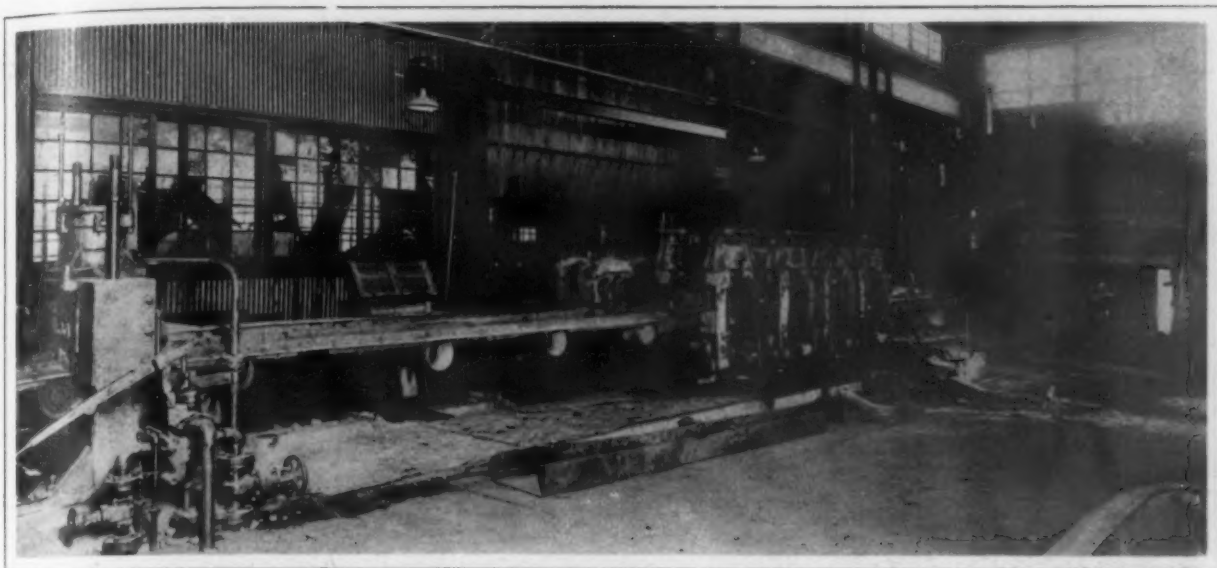
Plan to Show the No. 4 Merchant Mill of the Wisconsin Steel Company

material as it is delivered to the cooling beds, and the present length of the mill limits the cooling bed to a length of 175 ft. With these exceptions adjusted and with the addition of a second heating furnace the main drive, roll stands and other equipment of the mill are regarded as easily capable of delivering the larger output.

The heating furnace is of the continuous type with a 10 x 45-ft. heating chamber. The billets are carried on water cooled skids in the usual manner. The furnace is equipped with a Morgan gravity discharge with a special modification required by the firing of the furnaces with coal screenings from the bituminous field of Indiana and Illinois. The firing of this coal is done with a Jones underfeed stoker equipped with an automatic ash cleaning device. Instead of the overhead connections customary with furnaces burning producer gas, which permit a simple incline drop for the billet from the hearth to the mill table, the necessity for having the stoker grates below the hearth line and in front of the furnace required the arrangement of the discharge with a compound or reversed incline, the billet rolling off the hearth in the usual manner, striking against a water cooled baffle plate and delivering at a reverse angle to the tables which lie under the hearth. This arrangement brings the hearth of

pitch in the concrete sewers under the mills to permit washing the mill scale through a long underground conduit into the scale pit, which has done duty for the No. 1 and No. 2 mills since they were built. The angular gravity discharge and the necessity for having the mill tables directly under the furnace also entered into the consideration of the furnace elevation.

The laying out of the mill to give it its flexibility begins in the heating furnace with the spacing of the skid pipes. These are 20 in. apart, to carry billets of the minimum length of 2 ft. Inasmuch as the cooling beds are but 175 ft. long and 175 ft. of $\frac{1}{4}$ in. round weighs about 30 lb., it is necessary to start with the shortest billet available. The 4 x 4-in. billet of 24 in. length weighs 108 lb. Referring to the view showing the roughing stands, and also to the general view of the mill, it will be noted that an hydraulic shear has been placed between the furnace and the first stand and also between the roughing stands and the 16-in. mill. It is not feasible to roll a shorter than 24-in. billet in a continuous mill, but as indicated above, a billet of even this length would deliver a $\frac{1}{4}$ -in. round over three times too long for the cooling beds. So these billets are sheared after the roughing passes, while the long billets, which after one shearing are adapted in length to the



Heating Furnace Gravity Discharge to the Roughing Mill Approach Table, the Four Roughing Stands and Hydraulic Shear

rolling of the larger sizes of finished product for which they are intended, are sheared in advance of the roughing passes.

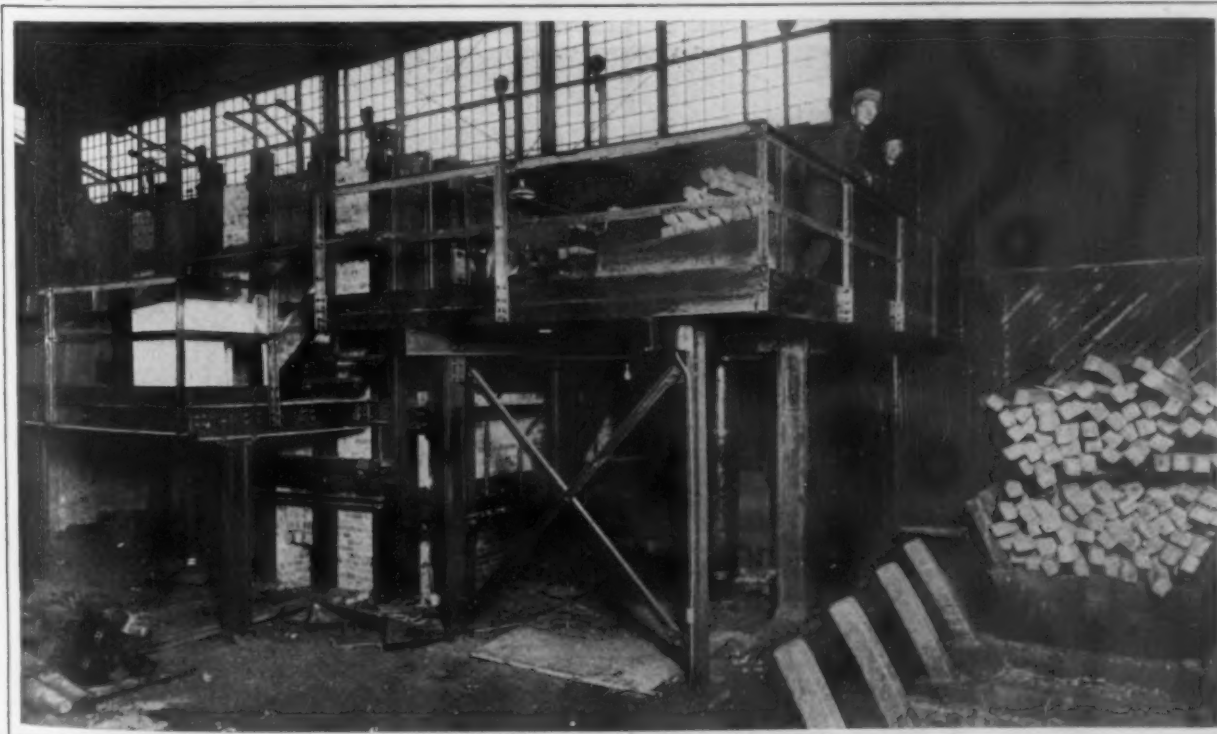
In view of the rapid reduction in cross-section of the pieces being rolled, the speeds at which the several mills operate, particularly the relative speeds of the four stands of the roughing mill, are interesting. The approach table for the roughing stands is geared to a speed of 314 ft. per minute, and the run-out table from the last roughing set to the 16-in. mill to a speed of 400 ft. per minute. The following table gives the maximum and minimum speeds of the mills:

	Engine at	
	90 r.p.m.	50 r.p.m.
First set 14-in. mill.....	14.84	8.24
Second set 14-in. mill.....	19.57	10.87
Third set 14-in. mill.....	30	16.66
Fourth set 14-in. mill.....	42	23.33
16-in. mill	137	76
12-in. mill	281	167
8-in. mill	617	343

The rolls of the 14-in. mill are 14 x 20 in., 4 ft. 6½ in. over all; of the 16-in. mill, 16 x 32 in., 6 ft.

2 in. over all; of the 12-in. mill, 12 x 20 in., 4 ft. 4 in. over all; of the 8-in. mill, 8 x 12 in., 2 ft. 11½ in. over all.

As has been mentioned, the mill design was influenced by the feature of quick roll changing made necessary by small tonnage runs. This feature is particularly prominent in the design of the 12-in. mill housings. These housings are arranged with open top and straight side windows to permit all three rolls being lifted out with the crane at once, yet at the same time, in order to avoid the trouble with similar mills, that of the rolls getting out of line, the housings are equipped with screws, both top and bottom, and the middle roll bearing is screwed down against a plate inserted in a slot between the middle and bottom roll bearing, thereby fixing the position of the middle rolls and keeping them in line. The plate is easily removed when changing rolls, permitting all three rolls to be lifted out at once. The housing cap, instead of being bolted on, is held in place by a tapered key as shown in the view of the 12-in. stands. This arrange-



Charging End of the Continuous Heating Furnace



The 8-in. Mill Pinion Housing and Drive Carried Across the Mill by a Sub-floor Shaft

ment is not new as applied to the housings of small mills, but has not been generally carried out for all of the housings throughout a mill, as in this instance. The pinion housings are the closed type, designed so that the bearings run in an oil bath.

The entire mill is driven from a main drive which is a C. & G. Cooper-Corliss tandem-compound condensing engine 30 x 54 x 60 in. in cylinder sizes. The engine is designed to run at an average speed of 80 r.p.m. with a variation from a minimum of 50 to a maximum of 90 r.p.m. The 14-in. roughing stands are driven through a train of machine molded gears direct from the main shaft. The 16, 12 and 8-in. mills are driven with a belt drive. The drive for the 8-in. mill is carried across under the floor of the mill through a 7-in. jack shaft. A general view of the main drive is shown among the illustrations. The condenser waste water is piped around to the end of the mill approach table under

the heating furnace and is used to flush down the mill scale through the concrete flume mentioned. This flow of water, added to the cooling water from the rolls, is sufficient to carry even the heaviest scale from the roughing stands. A similar flume extends out under the 12- and 8-in. mills where the water from the rolls is ample for washing the scale down.

The cooling bed is a standard Morgan type placed so that there is a straightaway run from the last set of the 12-in. mill up to the drag roll and the run-out table of the cooling bed. This is made necessary for the delivery of skelp and flats from the 12-in. mill. The small stock is looped through the 8-in. mill so that the angle of ascent to the hot-bed is very slight. As indicated in the plan and views of the mill the cooling bed is paralleled by a depressed loading track and is accompanied with the installation of a vertical shear for cutting to length. A shear is also installed for cutting left



Belt Drive for the 16-in., 12-in. and 8-in. Mills. The Roughing Stands Have a Direct Gear Drive from the Engine. The Drive Is to Be Guarded by a High Grating



The Five Stands of the 12-in. Mill. Housings Are Arranged to Facilitate Quick Roll Changes

over lengths into multiple sizes. A third shear is used for cutting up scrap.

The engineering for the mill was done by the staff of the Wisconsin Steel Company and the mill was built by the United Engineering & Foundry Company. Unusual attention has been given to the excellence of construction in the mill building itself. Steel skeleton; Federal tile roofing; heavy corrugated steel wall covering, with the lower half of the wall equipped with vertically sliding doors, so that the mill can be thrown open in mild weather and tightly enclosed in bad weather; Tungsten high power electric lighting; monitor roof ventilation, and overhead gangways wherever safety is involved are some of the features. The building has an overall length of 370 ft. and is 84 ft. wide with a 35-ft. lean-to for housing the main drive and the roll shop. This roll shop is equipped only for the requirements of this particular mill and is auxiliary to the main roll shop of the plant. It has two 26-in.

and one 18-in. roll lathes which are motor driven with enclosed gear drives, and the large lathes are equipped with two sets of housings for turning two rolls simultaneously.

The Wisconsin Steel Company is also increasing the capacity of one of its blast furnaces and installing an additional store to meet the larger heating requirements.

The officers of the Chester Steel Castings Company, Chester, Pa., are so much encouraged with the outlook that they are spending considerable money on plant improvements and betterments. This applies more particularly to improvements and labor-saving devices being installed in the open-hearth foundries and pattern shop. In addition to these changes which are being made with a view of increasing the output, the entire plant is getting a thorough overhauling. Furnaces are being rebuilt and all heavy duty cranes are being put in the best condition for service.



Detail View of Morgan Cooling Bed Showing Drag Roll, Shear for Cutting to Length and Distributing Skids and Cradle

The American Steel-Rail Situation*

Mechanical Practice of American and Canadian Mills—Effect of Wages Based on Tonnage—Larger Rail Sections

—BY ROBERT W. HUNT—

One of the most serious and important economic administrative problems facing American railroad authorities to-day is that of their rails, and it is one to which much thought is being given, not only by the executive officers of the railroads and the manufacturers of the steel rails, but also by State and national commissions. It is realized by many and admitted by some that the present situation is one which cannot continue. The roadways of railroads must be made more secure, or the weight of rolling stock and the speed of trains must be lessened; and the desired result must be attained with the minimum outlay of money, both in expenditure on plant and in cost of operation. If the investment per mile is too large, or through the lessening of tonnage and efficiency of equipment the cost of operation is too great, the desired and demanded cheap service cannot be rendered to the public. Therefore, the weight of equipment cannot be greatly reduced, and lessening the rapidity of service would be far from satisfactory; consequently, the safety of the roadway must be secured with the least practical outlay.

It is imperative that the roadbed should be properly graded, with the fewest practically possible curves; that it should have good ballast, be well drained, have good ties properly spaced, and be laid with sound rails of suitable weight, efficiently joined together, and that the whole property be carefully and intelligently cared for.

IMPORTANCE OF SOUND RAILS

My province is to treat of the sound rails. During the last few years there has been renewed interest in and discussion of this question, and I know that many rail makers not only have been and are desirous of maintaining the highest standards of manufacture which they may have attained, but have been and are seeking to better their product, in several instances devoting much time and money to that end. At the same time, they realize that the cost of any improvement in quality which they may accomplish must be kept within certain commercial bounds; and that fact is as fully understood by their patrons as by themselves, and it should be kept in mind by all who discuss the question. As a matter of record, I present in the table a summarized statement of what may be called the mechanical practice of the steel-rail mills of the United States and Canada.

WAGE RECOMPENSE BY TONNAGE

It will be noted that the several works differ in their practice as to kinds of steel, size of heats, size of ingots, kind of blooming and rail trains, number of passes in the rolls of both trains, and as to direct rolling into rails; also as to the details of the finishing departments of the several mills. In consequence of such variations, there are, of course, differences in the operating practice of the several plants. One thing that, in my judgment, has had a great effect upon the quality of the product of

all the mills is that the workmen have been and are paid on a tonnage or piece basis, with, in some cases, an additional prospective bonus based on quantity of product. Unfortunately, after the produced rails had left the works, there was but little chance of the identity or individuality of the workmen in the different departments of the works, who made them, being connected with them.

It is true that a number corresponding with that of the heat of steel from which they had been rolled, and the month and year in which they were made, and the name of the works, were branded on each rail, but to actually identify the steel maker who made the steel, the heater who heated it, the roller who rolled it, the shearman who cropped the blooms, etc., would have been a complicated and practically impossible proposition. One result was that if, for any reason, such as delays from accidents to machinery, etc., the quantity of product was threatened, there was temptation to in some way cut corners, the workmen knowing that if the rails were once out of the mill they need not worry over any individual responsibility. This feeling was simply human.

In an endeavor to meet this and other phases of the situation, some two years ago I ventured the establishment of a system of more constant and thorough inspection of rail making than had been generally, if at all, practised. In this movement I received the support at first of several and later of many of the railroad companies of this continent, and I am happy to say that I have also received the loyal support of the officials of the several steel companies. This system of inspection I explained in a former paper, presented at the Cleveland meeting, October, 1912, entitled "Recent Developments in the Inspection of Steel Rails."

SOUND RAILS ONLY FROM SOUND INGOTS

I have repeatedly shown that without sound ingots there will not be any certainty of producing sound rails; and that, as each ingot is an individual steel casting, some means should be adopted of testing for soundness the rails produced from each ingot; and until reliable ways of casting sound ingots are adopted the importance of such testing should not be overlooked or underestimated. It is possible to make sound ingots. It will cost more than the present practices; but is that a good argument against it? Whether that increased cost should be added to the selling price of rails is a commercial question outside of the province of this paper. The increased cost of individual ingot testing is so small that it should not be a matter of much commercial importance.

INCREASE IN RAIL SECTIONS

There is another feature of the situation which demands and is receiving serious consideration from railroad officers, consulting engineers, the steel works officials, and others. That is, the desirability, if not the absolute necessity, of increasing the weight of rail sections. A number of such sections have been designed, and some have been rolled, and the rails are in use; but there is a metal-

*A paper presented at the New York Meeting of the American Institute of Mining Engineers, February 18, 1914.

lurgical feature involved which should not be overlooked.

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The experience of many railroads has been that their earlier rails, which were of lighter sections, gave better service than the later heavier ones, and the track men will tell you that when they cut one of the old rails they found a close, fine-grained structure, while the larger rails show a more or less coarse one. The old lighter rails permitted the fining effects of the rolling to penetrate, and, the mass of metal in their heads being comparatively small, the effect of the interior contained heat passed off sooner. The foregoing conditions result in the webs and flanges of all rails having a finer structure than their heads; therefore, as we increase the size of the rail sections we will certainly decrease their proportionate strength, and under present manufacturing conditions the heavier rails will have less resistance to the abrasive wear of the traffic. Nevertheless, there seems to be a necessity for heavier rails, and so much the better, if we can also make them proportionately stronger.

Excepting in the ability to roll rails by the use of fewer passes in the rolls, and to handle the operations mechanically and automatically, there have not been any radical changes in rail rolling. The plan of rolling reductions has remained much the same. Some experiments have been made, and various schemes have been proposed, but none of them are in active use. In my judgment, the present situation demands serious consideration, even though it should require very radical changes in the rolling machinery of the existing rail mills. If we must have rails with more metal in their heads, as well as thicker webs and flanges, it is most important that the work of reduction and formation from the, say, 8 x 8-in. section of the blooms shall be applied in a way to penetrate and fine the metal in the rail heads.

I shall not here attempt to particularize the way, but no doubt a modification of the universal mill, as in the Gary mill for structural sections, will suggest itself as one possible way, and I know of several schemes which contemplate putting work on the top of the heads in addition to only the sides, as is the case with the present mills. If that must be accomplished to solve the problem, it can and will be done. Once more I emphasize the truth that the physical treatment of the metal is of at least equal importance with its chemical composition.

As early as February, 1913, several meetings of prominent makers of Welsh tin plate took place with a view to controlling the output, production being considerably in excess of the demand. Developments since then have resulted in the formation of an association. Competition for orders has been so keen and so seriously felt in recent months that the movement has gained the co-operation and approval of a large majority of the producers. The practical loss of the American and Canadian markets has been a deciding factor.

The plan proposed is similar to the one recently adopted by the British galvanized sheet industry, as reported in *The Iron Age* January 15, 1914. The output is to be controlled by a pooling arrangement, each member's allotment being in proportion to its average output over a certain period. For exceeding the allotment payments must be made into a pool. No attempt is made at direct control of prices. When the association was formed 432 of the 530 mills in South Wales were represented and other companies expressed approval by mail.

AUTOMATIC DRILLING MACHINE

A New Multiple-Spindle Vertical Turret Type for Rapid Production Work

The Windsor Machine Company, Windsor, Vt., has added to its line the Gridley automatic multiple-spindle drilling machine which is designed for drilling, reaming, counterboring and facing parts which are difficult to handle in the usual way, at the same time producing a saving of time and floor space. The machine is of the vertical-turret type and differs radically from other machines of its class in that the spindles are adjustable both radially and circumferentially, which permits their location at a common center or at different points. Holes can be drilled, cutting into one another or as far apart as the capacity of the machine will allow. The spindles are also individually adjustable vertically so that the tools may be placed in position to act upon any point or at any depth regardless of the location of the others. As all the spindles are sup-

ported from the center column around a practically complete circle, the thrust on one side balances that on the other, and therefore the column receives no undue strain from heavy feeds.

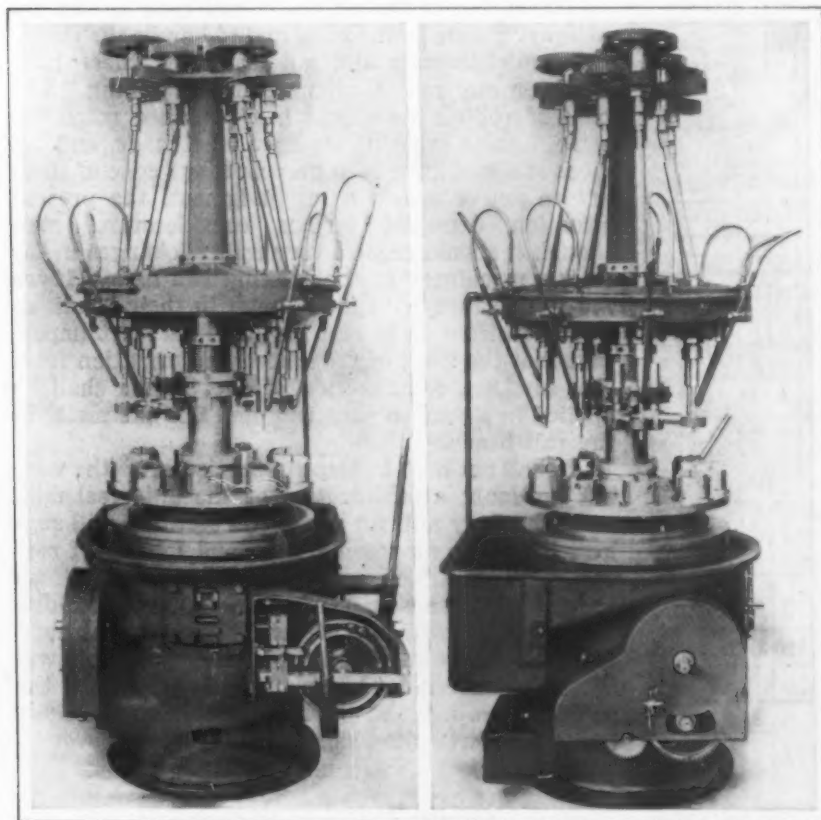
the machine as may be required by the class of work which is to be handled, but the usual number is five to nine. In order to divide the time of the various operations into the nearest possible uniform period it is sometimes advisable to use two or more spindles on a given hole at the same time, each doing its share of the whole depth. Each spindle can be geared to the correct speed for the tool which it carries. In cases where unusually heavy service is required of one or more tools, special heavy spindles can be employed.

Two methods of holding drill bushings are employed in drilling a layout of holes to insure accurate spacing between them. When only a few drills or other tools need guide bushings the holders are arranged each with an adjustable vertical and horizontal arm as is illustrated in one of the engravings. When a large number of holes are to be drilled a plate is furnished extending around the center column between the work carrying table and the spindle. In this plate are large holes, one in line with each spindle, and over each hole is clamped a small adjustable iron bushing which can be quickly set to the required position. In

arranging the machine for a new job the bushing holders only are changed. On some classes of work only one or two of these may require adjusting. For drills and some other tools hardened steel bushings are used, but those for tools with only short flutes are of bronze. No trouble is experienced at high speeds under this method, and the guides also act to prevent chattering.

There is little difficulty in setting the machine for operation on different pieces of work. The tools are inserted in their holders, a perfect sample of the size and finish of the piece to be made is placed in the chuck or fixture, and the table advanced by hand until the piece is located at the spot under the first spindle where the operation commences. The spindle is then swung into exact position, and the guide, either bushing holder or bracket, is securely fastened in the proper position. After raising the table to its highest cutting point the spindle is adjusted vertically to secure the proper depth of the hole. The

operation is repeated until each tool is properly located. Then by referring to the table of spindle speeds the proper gears are placed on the center shaft and spindles, and brought into mesh. Located at the lower left side of the machine are the change gears which give the different speeds to the vertical center shaft. Here also are the feed gears, giving the different tool feeds to the table. After the proper speed and feed gears are in position the table is brought up to the position where the first tool of the set to cut nearly touches the work. At this point a cam pin on the operating disk is set to throw out the fast feed clutch, which will allow the feed gears to drive the table at proper tool feed. After the table has reached its highest point and the tools are through cutting, the second cam pin on the operating disk is set to throw in the fast feed clutch. The machine is then ready to start and

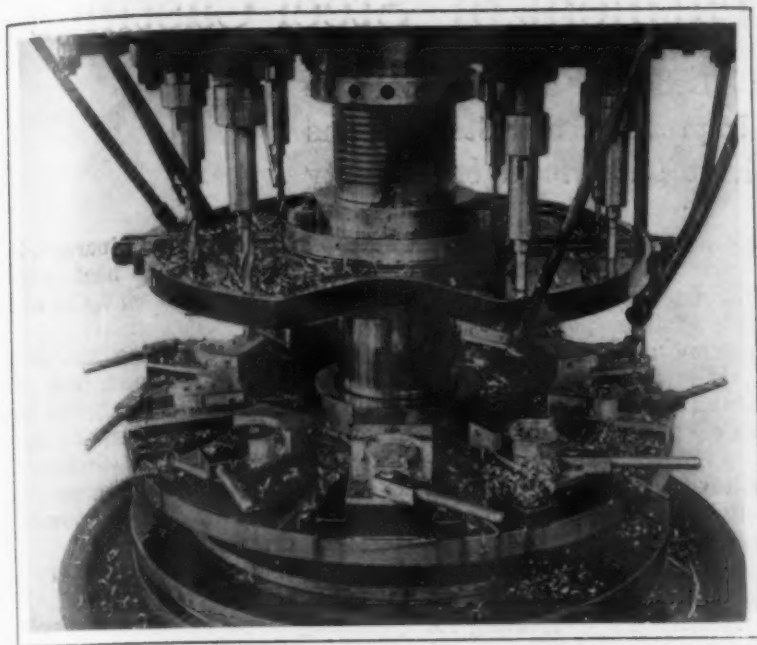


Front and Side Views of the New Gridley Automatic Multiple-Spindle Drilling Machine

ported from the center column around a practically complete circle, the thrust on one side balances that on the other, and therefore the column receives no undue strain from heavy feeds.

The work is held in chucks or fixtures on a work table which rotates, as indexed, around the center column. At the front of the machine is the idle position where the finished piece is removed and the blank inserted. In one of the cuts a blank is shown mounted in the fixture, while the die in the fixture at the right hand is finished, and is ready for removal when the table is indexed to bring it to the loading space.

The table indexes one point each time it is lowered to take the work away from the tools. The time required to produce one finished piece is that of the longest operation plus the idle time required in indexing. As many spindles can be built into



Details of Work Positions and Plate Guides for Tools

each time it indexes a blank is placed in position.

The machine is provided with a gear-driven oil pump, oil tank and separate oil supply with adjustable nozzle to each spindle. Ample drip room is provided with self-draining drip tank, strainer and room for removing chips without disturbing the oil guards.

The Standard Motor Company, Mason City, Iowa, has acquired the plant and business of the Nevada Mfg. Company, Nevada, Iowa. Some of the operations of the Nevada plant will be transferred to Mason City but the plant will continue in operation and its activity will be increased.

Semarang, Java, Exposition

The attention of manufacturers is called to the Colonial Exposition to be held in the city of Semarang, Java, in the months of September, October and November, 1914, to celebrate the centennial of the return of the Dutch East Indies under Dutch rule after political affairs in Europe had been readjusted, following the defeat of Napoleon and his banishment to St. Helena.

The growth in the commerce of these islands, of which Java, Sumatra, Borneo and Celebes are the principal ones, has been phenomenal in the past decade, the imports expanding from \$73,200,000 in 1900 to \$130,000,000 in 1910 and the exports from \$100,000,000 to \$180,000,000. They have a population of 30,000,000, and the projectors of the exposition believe that it will offer opportunities for American manufacturers wishing to introduce their goods, such as machinery adapted for use in sugar mills, machine shops, shipyards, etc., and also articles of luxury, as the white population consists of people of means who are liberal buyers. The native population has shared in the general prosperity of the past ten

years, which has increased its purchasing power.

The representative for the United States is T. Griedanus, who has opened an information bureau at 136 Water street, New York.

The Fletcher Engineering Company, consulting engineer in reinforced concrete, steel and mill construction and power plant design, Bridgeport, Conn., has been reorganized under the name of the Fletcher & Thomson, Inc., with offices at Bridgeport and at 30 Church street, New York. Leslie E. Fletcher is president; C. L. Thomson treasurer, and Wallace Sinclair secretary.

The Gage Structural Steel Company, Chicago, was recently awarded contracts for a refrigerating plant at Montevideo, Uruguay, 24 tons; cold storage plant at La Plata, Argentine, 300 tons, and Australian Meat Export Company, Eton, Australia, 1100 tons.

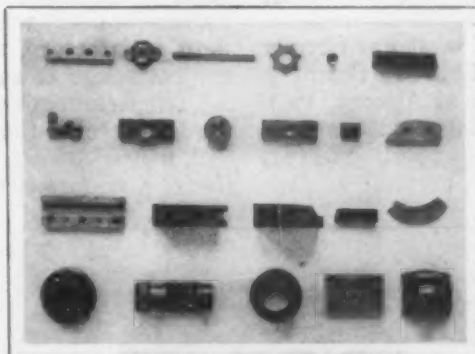
Effect of Manganese on Cast Iron

The effect of manganese on the mechanical properties of cast iron is dealt with exhaustively by F. Wuest and H. Meissner in an article in *Ferrum* for January 8, 1914. Some of the conclusions are these:

Manganese up to about 1 per cent. raises definitely the tensile and bending strength. With a higher percentage of manganese the strength decreases.

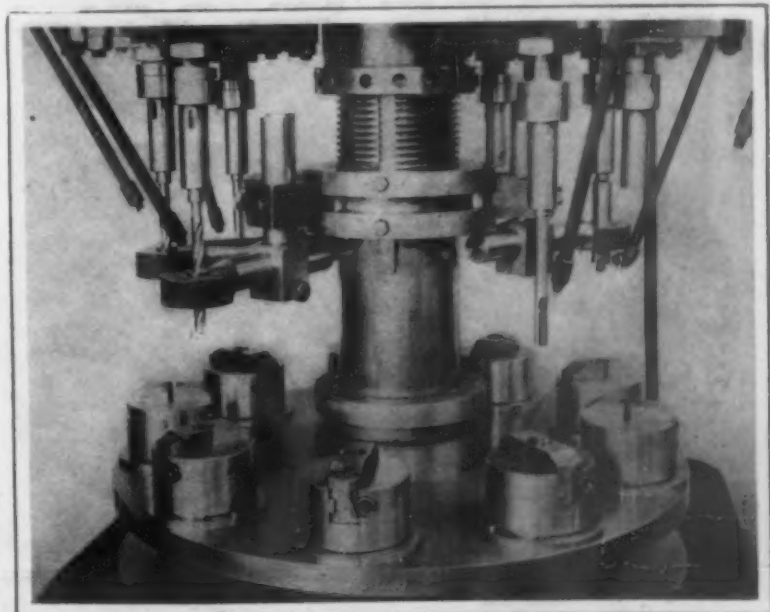
The hardness increases with the increase in manganese. With low manganese content the hardness remains tolerably constant in consequence of increased separation of graphite.

Small amounts of manganese up to 0.30 per cent., with about 1.50 per cent. silicon, increase the formation of graphite.



Sample of Work Done by the Machine

The Midvale Steel Company's net profits for the year ended October 31, 1913, are reported at \$767,931. The surplus at the close of the year was \$3,775,752.



The Adjustable Vertical Horizontal Arms for Holding Guide Bushings

Special Heat Treatment of Steel Castings

Effect on Bolsters and Locomotive Frames in Improving Their Strength and Value Without Impairment of Ductility

The subject of increasing the strength of steel castings by special heat treatment is of increasing importance and of considerable difficulty. In the opinion of some users the present methods of the producers of simple annealing or air tempering are inadequate to bring the desired results. It is not surprising, therefore, that the proposal of the user, especially a railroad, to heat treat its own castings should be taken up seriously.

For some time the Pennsylvania Railroad has been experimenting on the effect of the special heat treatment of steel castings, particularly bolsters and locomotive frames. An important paper, embodying a summary of these experiments, was presented at the New York meeting of the American Institute of Mining Engineers, February 18, 1914, by C. D. Young, engineer of tests of the railroad, O. A. D. Pease and C. H. Strand, the major portion of which is given below:

In an effort to employ cast steel of a stronger structure than that found in the annealed steel castings, the possibilities of heat treatment which will increase the strength without materially decreasing the ductility may be resorted to. An abstract report (which is a brief outline of what has already been done by the Pennsylvania Railroad Company at its shops and test laboratories at Altoona, Pa.) is of material interest, as it indicates what may be done with steel castings when properly treated, thereby permitting in railway service greater

strength of cast steel parts without any increase in weight or space. The question of the heat treatment of alloy steel castings is not taken up in this paper.

The obscurity formerly surrounding the heat treatment of steel has been for the most part removed by the development of our knowledge of the critical points of steel, pyrometers, furnace construction, and the testing of the finished product.

The operations of the heat treatment proper are taken up under the heads of (1) heating for quenching; (2) quenching; (3) drawing.

HEATING FOR QUENCHING

Heating for quenching is best conducted slowly, especially in the case of castings of variable thickness. Cracks may occur either in heating or in cooling, due to different temperatures at different points of the casting. The castings should be thoroughly soaked at the maximum temperature (generally 1500 deg. to 1600 deg. F.), 1 hr. being sufficient for sections 1 ft. in thickness. The minimum temperature which will produce the desired hardening effect will, in all cases, be found to be the most satisfactory, as the grain coarsens when the critical range is exceeded to too great an extent. All temperatures should be governed by a checked pyrometer with the hot junction to the heated object, and with several couples in a large furnace to insure a uniform temperature.

THE QUENCHING OPERATION

The casting should be transferred as quickly as possible from the furnace to the quenching bath, and in the case of large castings, such as locomotive frames, this is by no means a simple matter. The larger castings are best handled by means of cranes and rollers. The quenching agent employed is generally water or oil, preferably the former, because of its cheapness and drastic cooling effect, more readily breaking up the coarse cast-steel grain. With intricate castings it is generally best to use oil. With water it is possible to have a large tank and a large running stream, serving to maintain a uniform temperature. Castings should never be thrown in to rest on the bottom of the tank, but should be agitated to prevent the formation of a coating of vapor, retarding the quenching effect. It is also best, whenever possible, to quench the thicker portions first.

Whenever possible the drawing should be done in a bath of some kind, such as lead, barium chloride, a ba-

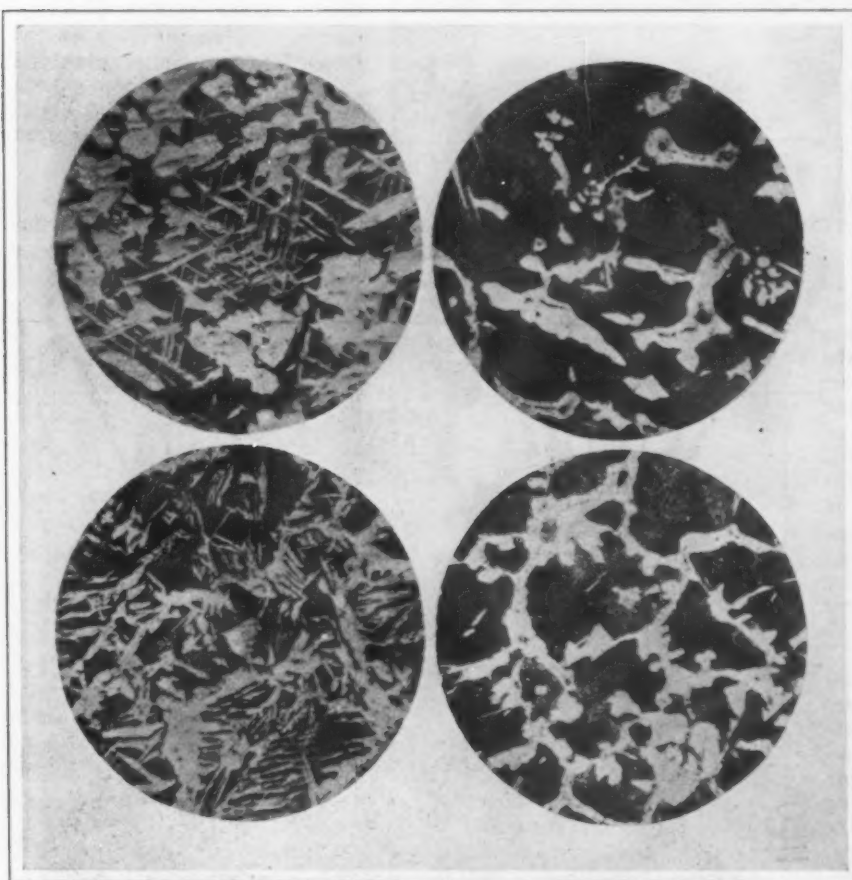


Fig. 1—Bolster B43
Fig. 3—Bolster B2

Fig. 2—Bolster B13
Fig. 4—Bolster B29

Photomicrographs of Commercially Annealed Cast Steel Bolsters. Reduced About One-third from an Original Diameter of 100

rium chloride-salt mixture, or oil. In the case of large castings this is manifestly impossible, and great care should be exercised in obtaining a uniform temperature in the drawing furnace. The use to which the casting is to be put determines the drawing temperature, railroad work, by reason of the shock and vibration of the road, requiring high ductility at the sacrifice of some strength.

The results of some tensile, chemical and micrographic tests of commercially annealed and experimentally heat-treated cast steel bolsters accompany this paper. The following table shows the heat treatment and the results of tensile and chemical tests:

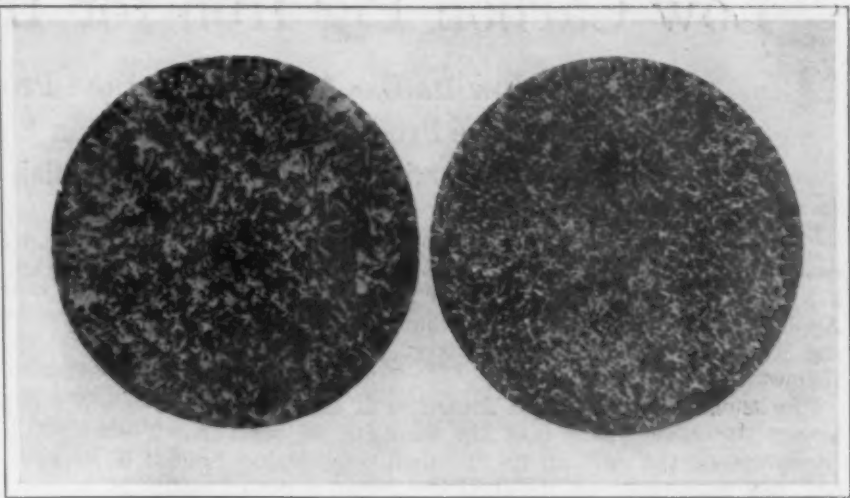


Fig. 5—Bolster B10
Fig. 6—Bolster B15
Photomicrographs of Heat-Treated Cast Steel Bolsters. Reduced About One-third from an Original Diameter of 100

Bolster No.	Commercially annealed				Heat treated			
	B43	B18	B2	B29	B10	B39	B15	BB
E. L., lb.	30,950	36,700	36,070	41,990	44,663	61,940	61,390	54,930
T. S., lb.	57,610	78,665	74,020	69,783	80,393	87,890	92,750	84,290
Elong. in 2 in., %	14.8	6.0	12.3	5.3	13.2	4.3	11.7	17.3
Red. of area, %	26.8	4.5	16.0	5.9	19.0	7.7	15.4	27.3
C., per cent.	0.31	0.51	0.35	0.49	0.32	0.33	0.33	0.30
M., per cent.	0.82	0.68	0.63	0.70	0.62	0.88	0.76	0.62
Si., per cent.	0.34	0.31	0.36	0.34	0.26	0.41	0.37	0.36
P., per cent.	0.016	0.045	0.036	0.036	0.042	0.014	0.041	0.032
S., per cent.	0.010	0.030	0.016	0.042	0.030	0.025	0.029	0.018
Annealed at, deg. F.	1,500	1,550	1,550	1,550	1,580	1,640	1,600	.....
Quenched in water at, deg. F.	.....	.....	.....	.....	1,600	1,600	1,600	1,600
Drawn to, deg. F.	.....	.....	.....	.....	900	900	900	900

Examination of the accompanying photomicrographs, Figs. 1 to 4, inclusive, shows the inefficiency of the manufacturer's annealing, which is by no means uncommon. The contrast between the annealing samples and the treated samples is readily apparent. Figs. 1 and 3 show a coarse needlelike ferrite formation, traces of the casting structure,

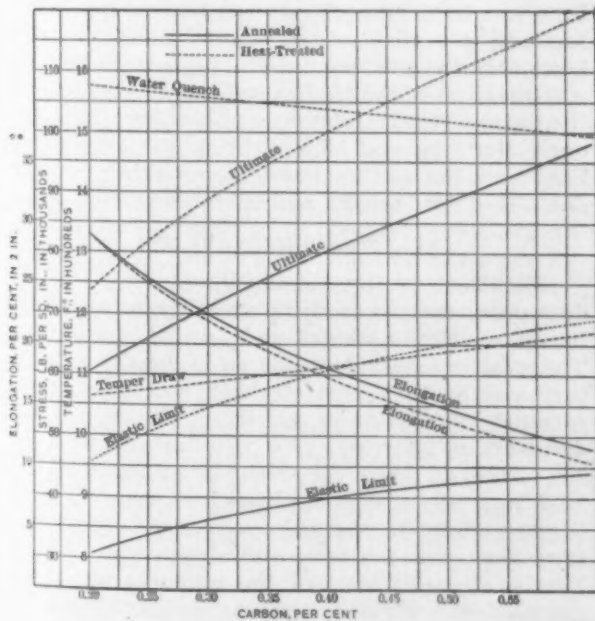


Fig. 7—Chart Showing Tests of Large Castings

not obliterated by annealing. Figs. 2 and 4 show the structure of some experimental high-carbon bolsters, which are not sufficiently ductile. Figs. 5 and 6 show excellent heat treated structures, with a very fine ferrite network. The heat treatment of these castings would have been more satisfactory with a drawing temperature of 1100 deg. F. instead of 900 deg. F.

The plot, Fig. 7, shows the average results of a considerable number of tensile tests made from large castings. It will be observed that the heat treatment increases the elastic limit about 50 per cent. and the ultimate strength about 25 per cent., without any material change in elongation. The heat treatment to produce these results is also shown in the plot. In the event a fair amount of ductility is required, it is not desirable to have the carbon content above 0.35 per cent. Individual results will vary from 5 to 10 per cent. from the average results.

The American Society for Fire Prevention

The American Society for Fire Prevention was organized February 11, with offices at 51 Chambers street, New York City. The society proposes to urge the enactment of laws and regulations to provide safeguards against fire, to compile and furnish information concerning fireproof materials and methods of construction and to conduct tests of building materials and safety devices. It is very broad in its membership qualifications. It plans to issue a monthly organ known as "Fire Prevention." Abram W. Herbst, formerly chairman of the committee on buildings of the Board of Aldermen, New York City, has been chosen director of safety of the society, and he is assisted by an advisory board, including architects, consulting engineers and others.

The General Electric Company reports recent sales of electric apparatus to the following: Bergen Point Iron Works, Bayonne, N. J., eight 110 to 125 hp. mill type motors, 36 motors ranging from 25 to 100 hp., 120 two-motor coal car equipments and 16 transformers; Atlanta Steel Company, Atlanta, Ga., a 500-kw. synchronous motor-generator set; Bethlehem Steel Company, South Bethlehem, Pa., a 3000-hp. induction motor; Pennsylvania Steel Company, for Steelton, Pa., a 500-kw. motor-generator set; Jeanesville Iron Works Company, Hazelton, Pa., a 300-hp. motor; Allegheny Steel Company, Brackenridge, Pa., two 12-hp. and four 40-hp. motors.

Low Carbon Pig Iron for Iron Castings

How Its Use Has Improved the Properties of the Product and Made German Founders Independent of Certain English Irons

An important contribution to the metallurgy of cast iron appeared in *Stahl und Eisen*, November 27, 1913, in an article by Alexander Zenzes on "The Application of Additions to the Charge in Producing High Value Cast Iron." A large portion of it follows:

In scientifically managed foundries it has been known for some years that the strength of cast iron depends not only on its chemical composition but also essentially on its structure; that a good cast iron, on which the severest demands as regards strength and density can be made, must have a structure of fine grain. This can be attained with certainty only by melting iron in a crucible, because there is no essential change in the original definite mixture due to the absorption of foreign ingredients. The best crucible cast iron is characterized by a low carbon content, which is not more than 3 per cent. In a cupola it is difficult to produce a good cast iron with less than 3 per cent. carbon because the cupola charge of pig iron seldom has less than 3 per cent. carbon and because also carbon is absorbed from the coke. The addition of steel scrap to produce higher tensile strength, though somewhat in favor, has also similar disadvantages arising from the use of coke, from the absorption of sulphur, etc., so that real success is never attained in this way.

USE OF ENGLISH BRANDS IN GERMANY

A few grades of cold blast charcoal pig iron, such as the English brands Frodair, Coldair, etc., have found special favor in Germany as an addition to cast iron to bring about a dense iron. They serve in many foundries, despite their high cost, as a cure-all without which dependable results are impossible. The analyses of these irons, recognized as especially valuable English brands, are by no means entirely good, especially as regards sulphur, manganese and phosphorus. The feature which confers on them the valuable property of producing a cast iron of very fine structure combined with density and strength is their low total carbon content.

In his capacity as managing engineer of a large Rhineland metallurgical plant, Alexander Zenzes was active in the iron foundry where iron of quality was made and where large castings with a minimum tensile strength of 18 kg. per sq. mm. were poured. The average thickness of all kinds of castings to be produced varied between 5 and 100 mm., and therefore it was not possible to keep one cupola in operation which could produce the necessary composition for these different transverse sections. Manifestly the strength of cast-iron sections is dependent on the structure; and the structure, in uniform foundry practice and conditions, is dependent on the chemical composition, which, however, cannot be changed so often nor in such short intervals as would be demanded by the thickness of all of the pieces to be poured. In spite of this, it was possible to pour each piece in the grade of iron as to composition corresponding to the transverse sections. Daily 10 to 15 tons of castings were to be poured for which a high tensile strength was demanded. Two small cupolas of 3 to 4 tons capacity produced two grades of cast iron. One cupola, with a charge of No. 3 hematite (1 to 1.5 per cent. silicon), steel

rails, scrap and Siegerländer alloy, produced a so-called hard iron of the following prescribed composition:

	Per cent.		Per cent.
Carbon	3.00	Phosphorus	0.10
Silicon	1.00	Sulphur	0.10
Manganese	0.50	Copper	0.10

The other cupola, with a charge of No. 1 and No. 2 hematite, low manganese iron, and scrap, produced a so-called soft iron of the following composition:

	Per cent.		Per cent.
Carbon	3.50	Phosphorus	0.10
Silicon	2.50	Sulphur	0.07
Manganese	0.05	Copper	0.10

To pour castings with a thickness of less than 10 mm. the straight soft iron was used; for those of 10 to 15 mm. thickness, a mixture of 2/3 soft iron and 1/3 hard iron; for those of 20 to 25 mm., 1/2 hard iron and 1/2 soft iron; for castings of 30 to 40 mm. thickness, 2/3 hard iron and 1/3 soft iron, and for castings of greater thickness only the hard iron was used.

The hard iron of the cupola was blown with tolerable certainty of a constant quality because the ingredients of the charge had a constant composition. Nevertheless the superintendent had a sample taken of every tap of the cupola, making the hard iron by taking a test with a spoon from the partly filled ladle after quickly stirring it. When the test piece, poured in sand and cooled in water, showed the expected amount of separation of graphite, the partly filled ladle was then at once filled with the amount of iron from the soft iron cupola necessary to make the mixture desired. This resulting mixture was then properly stirred with a rod of iron fastened to a piece of rail after a piece of lead had been thrown into the ladle. In this manner the volatilization of the lead as well as the stirring gave the gases a chance to escape. Each day a test piece one meter long and 30 mm. thick was taken of the hard iron, the soft iron and the resulting mixtures, and tested for bending and other properties.

EXACTING CONDITIONS MET

Manifestly in this manner it was possible to produce every desired mixture, and therefore any casting of a definite weight and limited cross-section. The most exacting demands as to density of structure and as to tensile strength and resistance to pressure could thus be satisfied. The results were decidedly satisfactory. No modifications were possible, and all chemical calculations for soft iron, hard iron and the finished product were the result fundamentally of the silicon content. A chemical laboratory was available and always open for use. Tensile strength tests of the products were taken almost daily. From the numerous tensile tests and also especially the bending and pressure tests, in conjunction with the chemical analyses, Mr. Zenzes became convinced that in the case of two test pieces of similar chemical composition as regards Si, Mn, P, S, and Cu, an essential difference in tensile and pressure characteristics could ensue. The literature on the subject, as well as all previous practical experience, could offer no solution of this phenomenon. It was manifest, however, from the square test pieces used to determine the resistance to pressure,

that of two pieces of like chemical composition as regards Si, Mn, P, S, and Cu, but of entirely different strength, the hardness of the pieces poured in dry sand differed in degree. From this the conclusion was drawn that the carbon content was the real measure of the physical properties of cast iron.

BEST RESULTS WITH CARBON UNDER THREE PER CENT.

The analyses for total and combined carbon afforded fully the right explanation: that of two test pieces of similar structure and chemical composition as regards Si, Mn, S, P, and Cu, the tensile strength is greater the less the percentage of total carbon and the higher the combined carbon in a test piece of gray structure. In the best cast iron with gray structure the percentage of combined carbon was from 0.80 to 1.00; of graphitic carbon about 2 per cent.; and the total carbon not over 3 per cent. Investigation of the cupola iron showed that the carbon content of the hard iron was mostly under 3 per cent., and therefore there resulted the best breaking tests with a tensile strength of 28 to 30 kg. per sq. mm. from a total carbon of not more than 3 per cent. and often less.

The desire arose, therefore, to produce a cast iron with less than 3 per cent. carbon. Attempts to do this in a cupola direct were unsuccessful because no pig iron with less than 3 per cent. carbon was available and because melting pure cast iron or steel scrap with ferrosilicon produces an iron of poor quality. Entirely different results are obtained when the white iron, blown at a high temperature in a converter, is used to mix with pig iron. By this means a desired or calculated composition results and always a carbon content of less than 3 per cent. attained. These experiments Mr. Zenzes announced in his patent, "Process of Producing Cast Iron of High Tensile Strength." This process is used with great success in numberless plants having small Bessemer converters.

MAKING LOW CARBON PIG IRON

In 1904 Henning, in Mannheim, announced a process for making a pig iron that will produce dense castings; it consists of mixing liquid pig iron and liquid steel. It is a German patent (D. R. P. 179,739). In using this process a converter outfit is unnecessary. Two German blast furnaces are operating very successfully in accordance with this process of Henning's, which enables blast furnaces to make a pig iron low in carbon. The English special irons, which have increasingly entrenched themselves in many German and foreign iron foundries, are being displaced by this iron from the two blast furnaces.

The success attending the use of briquettes of borings in foundries rests principally on the lowering of the carbon content. The use of special pig iron of low carbon content to produce castings of dense structure and high tensile strength appears to be better practice.

BENEFICIAL EFFECT ON MAGNETIC PROPERTIES

Of special importance is the use of special pig iron to produce castings which shall possess special magnetic properties. A cast iron has the best magnetic properties which has a low carbon content of fine-grained and dense structure. The combined carbon, of all other ingredients, has a lessening effect on the induction and should not be higher than 3 per cent. The lower the percentage of combined carbon, the lower is naturally the total carbon, provided that the elements which aid in the formation

of combined carbon, such as manganese, sulphur, etc., are present in corresponding amounts. A silicon percentage of 2 to 2.50 is best because it hinders the formation of combined carbon and furthers the separation of graphite.

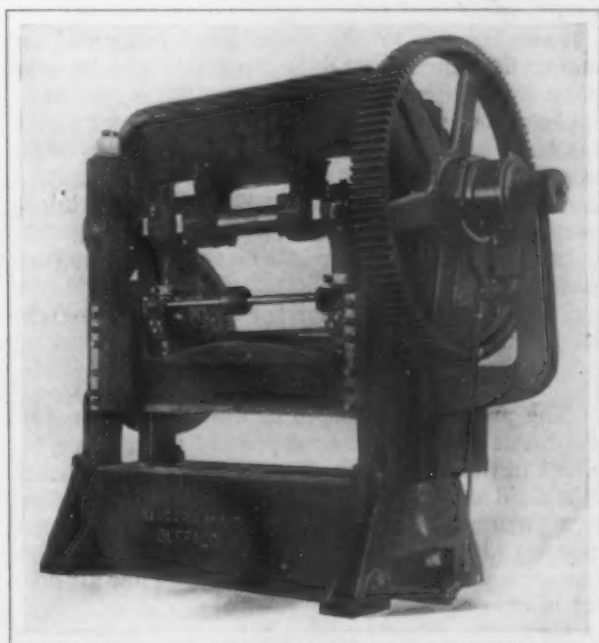
The experiments of Mr. Zenzes which led up to his patent, referred to before, showed that his product had excellent magnetic properties. The complaints of the electric industry that it is difficult to obtain cast iron of satisfactory electric permeability come to an end if castings are produced according to the process of Mr. Zenzes. It is true that by the use of steel scrap in the charge success has been attained in producing an iron having improved magnetic properties, but the use of low carbon pig iron is to be preferred under all circumstances.

Gratification is expressed that due to scientific efforts German founders are free from foreign fetters, being in a position to replace the special English irons with their own low carbon grades. Castings poured at the Concordiahütte from these irons carry conviction from their appearance, as to their wonderfully dense and uniform structure.

Large Double-Crank Single-Geared Press

For punching and forming operations for steel car work and also for a wide range of heavy stamping operations, the Niagara Machine & Tool Works, Buffalo, N. Y., has brought out a large double-crank press. The press illustrated measures 84 in. between the housings and weighs about 50,000 lb., but different sizes can of course be built.

Four steel tie rods, $4\frac{1}{2}$ in. in diameter, which are shrunk in place, are employed to hold the bed, the housings and the arch together. The adjustment of the slide and the gibs is secured in the



A Large Double-Crank Single-Geared Press for Heavy Punching and Stamping Work

same way as on the other large machines of the company. A hand lever operating a jaw clutch controls the motion of the press. The three jaws of the gear hub and the corresponding ones of the clutch collar have the working surfaces faced with hardened tool steel pieces. The slide can be stopped at the highest point of the stroke by an automatic device.

PNEUMATIC TOOL DESIGN*

Notes on the Development and Testing of Hammers and Drilling Machines

BY H. I. BRACKENBURY

The pneumatic hammer is a combination of a cylinder, reciprocating piston, a valve controlling the flow of motive fluid to and from the cylinder and a throttle valve in the supply pipe. All the earlier engines were designed to produce rotary motion or to work pumps. The idea of using a free piston was first suggested as a good means of rock drilling. Among the earliest inventors in this field was George Low, an Englishman, who in 1865 patented a rock drill having a hammering piston. Low is perhaps chiefly interesting as being the first to show a grasping-handle with manually-operated throttle valve within the control of the operator's fingers. Low was followed two years later by Doering, another Englishman, who was the first to patent a pressure-operated valve for this class of machine, in which the piston and valve are mutually interdependent, a principle used in all modern pneumatic hammers.

The first serious attempt to produce a practical metal-working pneumatic hammer seems to have been made by Boyer, of St. Louis, who, in 1883, patented a chipping machine with a grasping-handle and a throttle valve controlled by hand. Benjamin Brazelle, of St. Louis, in the early eighties obtained a patent in the United States for a steam pump disclosing a differential-area piston attached to a pump plunger, together with a differential-area valve, each of which served to control the operations of the other. Boyer seems to have drawn inspiration from Brazelle's invention, for in 1896 he brought out a metal-working pneumatic hammer involving Brazelle's design, but modified to suit the conditions of chipping, caulking, and riveting.

It was soon found that there was a large field for pneumatic hammers for closing rivets and this demand for pneumatic riveters led to the invention of the hammer in which a comparatively short piston was made to travel a distance much in excess of its own length. Boyer was probably the first to make a long-stroke hammer about 1899 by employing a valve at each end of the cylinder, connected together by two rods of small diameter placed in longitudinal passages drilled in the walls of the cylinder. Meissner, of St. Louis, at about the same time, brought out a long-stroke hammer with one valve only.

CONSIDERATIONS REGULATING THE DESIGN

The problems presented to the manufacturer of pneumatic tools differ considerably from those involved in the production of other machines actuated by a fluid under pressure. The desirable qualities in a pneumatic tool in their order of importance appear to be: Reliability, power, cheapness, lightness, ease of handling, compactness and low air consumption.

Up to the present probably too little importance has been attached to the last of these. It is no uncommon thing to find a large and expensive air-compressor plant eating up power and delivering enormous volumes of air to supply the incessant drain of leaking pipes and hose, and the intermittent demands of most wasteful types of tools. Perhaps it would be no exaggeration to say that quite generally the amount of air lost by leaking hose is almost equal to that used by the pneumatic tools themselves. Suppose there are a number of leaks

equivalent to a circular hole of about 1/10 in. in diameter. If the air supply be at 100 lb. per sq. in. pressure, the air leak will be about 15 cu. ft. of free air per min. or about 2 cu. ft. per min. of compressed air. The power required to compress this will be nearly 3 hp. In other words, the leak would waste about 120 cu. ft. of compressed air per hr.

DRILLING MACHINES

The factors governing the design of pneumatic drilling machines are entirely different from those for fixed machines. In the latter case, the machine is designed to run the drill at the speeds and feeds which will give the quickest penetration without undue wear to the drill. In the case of the pneumatic drill, the power is the governing factor, and therefore the design must be such as to use that power to rotate the drill at the speed at which the greatest penetration is given for the power. This is a slow speed, not a high one. The author found that an ordinary drilling machine requiring, for the same rate of penetration with fast speed and fine feed, double the power required with slow speed and coarse feed. These experiments were made with a drill in careful alignment with the work, and not with a pneumatic drilling machine supported by a springing arm and starting with the drill at anything but right angles to the surface of the work. The result is that the best effects are obtained by running the drill at slow speeds. The limit in this respect would be reached if the pressure required to feed the drill were more than could be conveniently given by the feed gear or the torque exceeded the strength of the drill body or cutting edge.

When the air is allowed to flow into the drilling machine, a high speed of rotation is set up until the feed is applied by the feed screw. The more rapidly the feed screw is rotated the quicker will be the penetration of the drill and the slower will the drill rotate, with the final limitation that if the feed is too rapid, the drill will stall suddenly and there will be no penetration. This appears to be a curious paradox, for, apart from considerations of wire drawing, the indicated horsepower of the pneumatic engine would seem to be dependent on its speed and the pressure of the air. The result arrived at is that the maximum speed of penetration is given by that speed of rotation at which the machine develops its minimum horsepower, but its maximum stable torque.

Considerable experience of running drills under test conditions has proved the importance of applying the feed with judgment. A man used to this work can get much better results out of a drill than can another man, equally intelligent and skilful, who is not so accustomed. It requires the greatest judgment to feed the drill so rapidly that it shall just escape stalling.

The idea of a minimum speed at which the pneumatic drill will run without stalling is of importance, because it should help to fix the gear ratio to be employed between the pneumatic motor and the twist drill. This critical speed is probably dependent not only on the size of the twist drill and the material it is to cut, but also upon the laws connecting the torque of the pneumatic motor with its speed of revolution, while this relation in its turn depends upon the pressure of air supply and the length and bore of the flexible hose.

The history of other prime movers would indicate the probability that there will, and should, be an increase in the speed of revolution of the pneumatic motors. Everything is to be gained by obtaining increased power from the same piston by running it faster, provided the design still ensures

*From a paper read before the Coventry Engineering Society, Coventry, England, January 23, 1914.

reliability and good wearing qualities. If this change occur, it will involve an increase in the gear ratio between the drill and pneumatic motor.

Pneumatic drilling machines may be divided into two classes. The first class comprises those operated by an engine of the piston and crankshaft type, the second those which rely upon some form of rotary engine. The second type is attractive on account of its beautiful simplicity, but, so far, the author has not found one capable of giving as large a torque for a given air consumption as those of the first type. The principal difficulty in producing even a reasonably efficient rotary pneumatic engine is the large leakage, which seems almost inevitable.

In considering the efficiency to be expected from either type, we should remember that the problems to be faced by the manufacturer of an engine as minute as that required for a pneumatic drill are peculiar to the production of any very small device operated by a fluid under pressure. Since the periphery of a body is proportional to its linear dimensions, while its area varies as their square, it follows that the leakage which occurs at a periphery assumes greater and greater relative importance as the size of that part decreases, and leakage is the principal bugbear of the designer of pneumatic tools.

TESTING PNEUMATIC DRILLING MACHINES

The measurement of the brake horsepower of a pneumatic drilling machine offers no particular difficulty if great accuracy be not required. For commercial purposes a prony brake is quite satisfactory. If, however, it be desired to investigate comparatively small changes of brake horsepower, a number of difficulties have to be surmounted.

Two forms of brake have been tried. The first consisted of a hollow copper jacket resting on a sheave, which was driven by the drill. The back center of the drill abutted on a support carried on an old lathe shifting head. The whole arrangement was fitted to a discarded lathe bed. Arrangements were made to keep a stream of cold water flowing continuously through the copper jacket. The latter was lined with lead, so as to bear evenly on the sheave. To one end of this copper jacket there was attached a heavy weight resting on a spring-balance, while a lighter weight attached to the other end was immersed in a vessel of oil, which damped down the oscillations until they did not exceed about $\frac{1}{4}$ lb. on the spring balance. Of course the lighter weight was corrected for the up-thrust of the oil. This arrangement was only fairly satisfactory. The brake used with it consists of a fine-quality cotton webbing, and the sheave has been made of larger diameter so as to minimize the rise of temperature.

It was found that over the speed range under investigation, 150 to 200 r.p.m., the horsepower developed increases more slowly than the revolutions. This speed range only was considered, because it corresponded to the actual rate at which the drill would be run in practice.

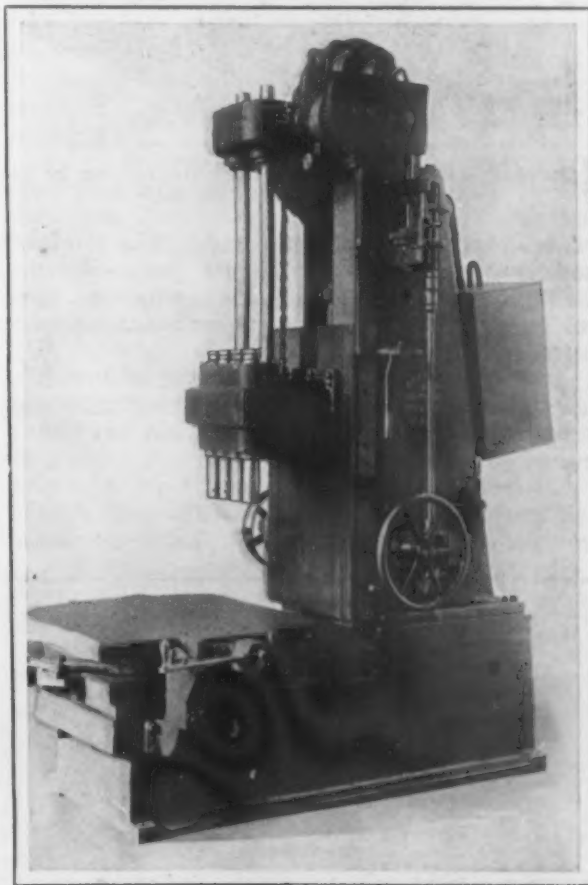
The practical testing of pneumatic drills is difficult, but the testing of pneumatic hammers for power is even more so. The apparatus used in testing pneumatic hammers consists of a massive cast-iron bed provided with T-grooves, so that a heavy block may be bolted to it in any desired position. Against this block is placed the handle of the hammer to be tested. The snap of the hammer abuts against a heavy block, which can swing about a vertical pivot fixed to the bed. This swinging block is controlled by a spring, which can be adjusted by means of a screwed bolt passing through the fixed abutment. To the swinging block is fixed

a light-steel arm carrying a stumpy pencil, the point of which rests on a strip of paper which can be reeled by hand off one drum on to another. As the instrument is only required to give the speed of the hammer, and a general idea of the type of oscillation produced, there is no need to employ a uniform drive for winding the paper.

Finally, although the production of a perfect pneumatic hammer appears to be more difficult than the production of a perfect pneumatic drilling machine, the author believes that the designs of hammers have reached a point nearer finality than the designs of drilling machines.

Four-Spindle Cylinder Boring Machine

The Beaman & Smith Company, Providence, R. I., has brought out a line of vertical-spindle cylinder boring machines which can be supplied with three, four or six spindles. The four-spindle type is here illustrated. The power is transmitted to the spindles from a $7\frac{1}{2}$ -hp. driving motor, through spiral and spur gears. The spindles are mounted in an en bloc head attached to a counter-balanced saddle. The spindle bearings are of the



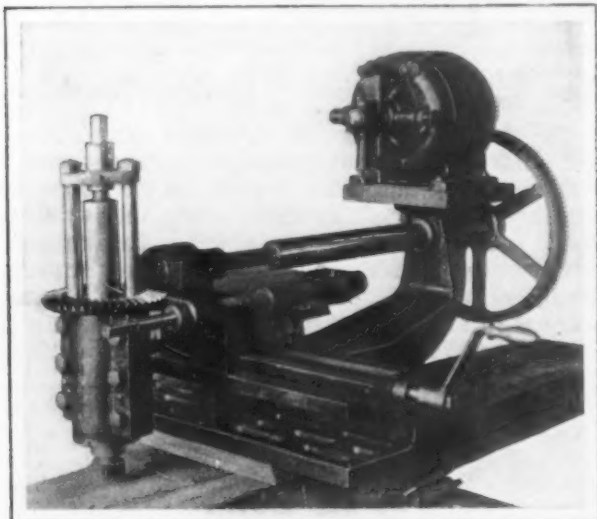
One of a New Line of Multiple-Spindle Cylinder Boring Machines

taper type in bronze boxes and provision is made to compensate for wear. The saddle has a vertical movement of $29\frac{1}{2}$ in. and is provided with an automatic feed and stop and quick power movements.

The work table, which is 36 in. square, revolves. It is supported on a ball bearing and has two index points. The work is held in fixtures, which enables the finished piece to be removed and replaced by another, while a second piece on the table is being bored. This, it is pointed out, makes it practically a continuous operation. When the work is placed on the table and is ready to be moved under the spindle the table is lowered into position and held in place.

Portable Motor-Driven Milling Machine

A small general purpose portable milling machine which can be driven by an electric motor, through a belt connection or even by hand, has been placed on the market by the Pedrick Tool & Machine Company, 3640 North Lawrence street, Philadelphia, Pa. The machine is adapted to either a vertical or horizontal position and can be employed for facing small valve seats, milling seats in pumps and engines, valve port edges, pads on large frames or housings, making keyways in shafts and also



A Portable Milling Machine Arranged for Driving by an Electric Motor, a Belt or by Hand

for drilling in cases of emergency. The width of the keyway, it is pointed out, is not restricted to the size of the cutter, as an endmill is employed, thus making it possible to cut large or small keyways easily.

The machine is built in two sizes and with a view to giving greater convenience in operation and lessening the weight, automatic feeds have been omitted on the smaller one.

The spindle, which has a long bearing to give rigid support and durability, and the quill revolve together. To prevent wear and permit the cutter

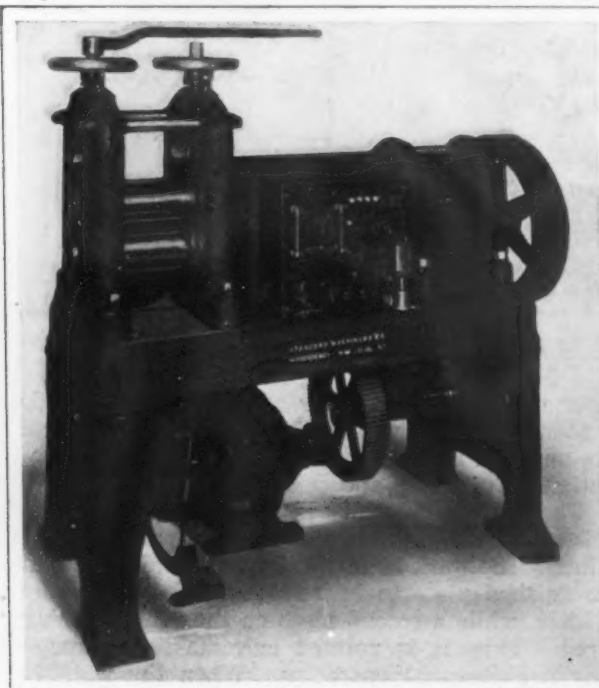
to jump away from the cut, shoulders and collars have been eliminated. When the diameter of the cutter being used is no greater than that of the spindle, the spindle and the cutter are removed from the bearing for resharpening or replacing the cutter by loosening two nuts. A practical value of this point is that when working in a small deep chest where it would be impossible to reach in and unscrew the cutter if it broke or became dull, as it is not necessary to remove the entire machine. The taper of the spindle conforms to the regular standard so that it is possible to employ commercial cutters. The smaller machine will face a surface up to a maximum size of 8 x 12 in. and the spindle has a vertical adjustment of 6 in.

Rolling Mills with Foot Control

The Standard Machinery Company, Providence, R. I., has brought out two new types of rolling mills. One of these is a motor-driven mill, equipped with a foot control and the other is arranged for belt drive. Both machines are equipped with rolls 5 in. in diameter and 8 in. wide, and the wabblers and their couplings and the heringbone pinions are covered by hoods.

The rolls used by this machine are of hardened and ground Krupp steel and the journals, which are $3\frac{3}{8}$ in. in diameter, run in the builder's patented roller bearings. The housings have handwheels with a micrometer adjustment. The back gear ratio of the mills is 16 to 1. The mills weigh approximately 3600 lb. and occupy a floor space of $2\frac{1}{2}$ x 7 ft.

The mill shown at the right of the accompanying engraving is equipped with a constant-speed motor with a special controller that permits it to be started and stopped by foot control. An oil switch located underneath the bed is connected to the automatic switch shown and allows the operator to press down and lock the treadle on a special treadle stand having a shoulder on it. When the rolling operation is completed, it is possible to kick the treadle on the side, thus allowing it to snap back by the spring and stop the motor. With the exception of the motor train the machine is triple trained, the gearing including the intermediate and



Two Recently Completed Types of Rolling Mills Having a Special Arrangement of Foot Control for Use with Motor or Belt Drive

driving train on the machine proper and the cut steel herringbone gears in the gear housing. The motor pinion is of rawhide and meshes with a cut steel gear on the driving shaft.

The other mill is the same machine modified for a belt drive. The special features of this one are the use of a one-piece bed and the exclusion of the legs and bearing bracket below the separate bed. This arrangement, it is pointed out, gives a self-contained unit, occupying the same floor space as the motor-driven type. The clutch used with this mill is of the cone type running over a hollow shaft and this arrangement is relied upon to enable the mill to be started and stopped without it being necessary for the operator to use his hands. The clutch is thrown in and out of engagement by a spiral spring, which is on the driving shaft and there is a take-up on the end of the spring.

Shearing Machine for Irregular Curves

A new type of machine which is designated as the Lennox Serpentine shearing machine is being marketed by Joseph T. Ryerson & Son, Sixteenth and Rockwell streets, Chicago, Ill. It is designed especially for the straight and irregular cutting of plates and sheets, and it is claimed that the cost of doing this work is reduced one-half, as the machine replaces the old type hand and power cutting machines and thus saves the time and labor of handling.



A New Type of Shearing Machine Designed Particularly for the Straight and Irregular Cutting of Plates and Sheets

employed in the operation of the machine and is mounted on a cast-iron base. All the gears have their teeth cut from the solid metal and are covered by cast-iron guards to protect the workman while operating the machine.

The blades are made of high-grade tool steel and are set in approximately a horizontal plane. It is emphasized that this arrangement gives a large center bearing on the material being cut, and in consequence there is but little distortion. The machine will handle not only straight cutting, but also in or out curves, having a minimum radius only slightly larger than the diameter of the cutting blades. Positive drive is provided for the upper cutter and the lower one is mounted on an adjustable sleeve, which enables its position to be varied to compensate for different thicknesses of material and also to permit of redressing. In addition, a cam provides for the dropping of the lower blade to

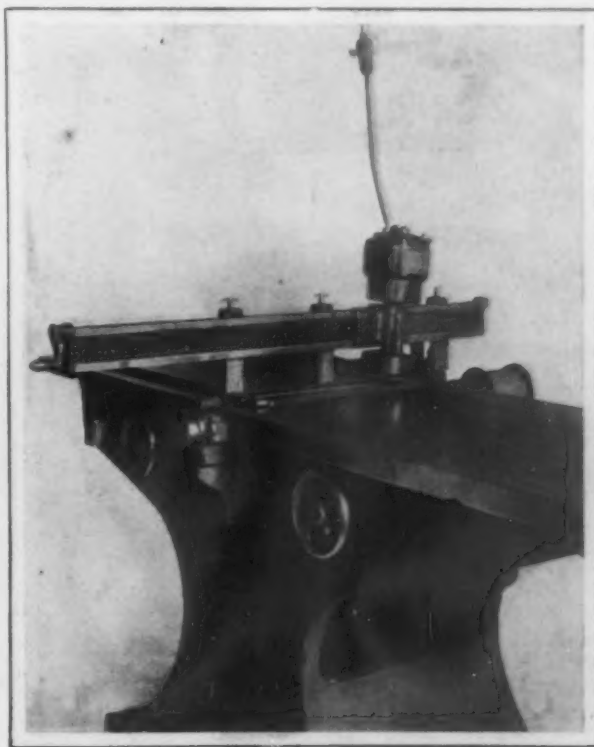
enable the sheets to be removed without reversing the machine. The fastening of the cutters to the shaft is flush, so that no projecting nuts interfere with the handling of the work and the knurled edges feed the sheet into the machine automatically. The end thrust on the lower cutter shaft is taken up by a tool steel pin. Where a number of sheets are to be cut to the same pattern it is possible to bolt a template to the work. This is guided against the upper cutter and exact duplication of the desired pattern is secured in this way.

The machine illustrated has a capacity for cutting No. 10 gauge material and lighter, while other sizes for handling No. 16 gauge sheets and material $\frac{1}{4}$ and $\frac{3}{8}$ in. thick can be furnished. The power is supplied by an electric motor or a belt connection to a two-speed pulley. This arrangement, it is pointed out, gives a slow speed for intricate curve cutting and a high speed where straight work is being done. The main driving shaft is extended and squared on one end so that it is possible to use a hand crank if power is not available for operating the machine.

Grinding Machine for Jointer Knives

To allow the knives of a planing or jointing machine to be ground without removing them from the machine, the Stockbridge Machine Company, Worcester, Mass., has brought out a portable grinding machine. The knives once in place, it is claimed, may be kept there until entirely worn out and harder knives may be used than where they are whetted with a file and oilstone. Proper alignment of the knives and an increased output are also made possible. These grinding machines give the knives the desired edge right on the machine in 5 to 10 min. instead of requiring 30 to 45 min. two or three times a day when employing an oilstone.

The machine, which is named the Quicsharp, is motor driven, the motor being mounted in the grinder head and taking its current from an ordinary lamp socket. A split nut engaging the feed screw which lies along the top of the bridge is at-



A Motor-Driven Grinding Machine for Sharpening the Knives of Woodworking Machinery without Removing Them from Position

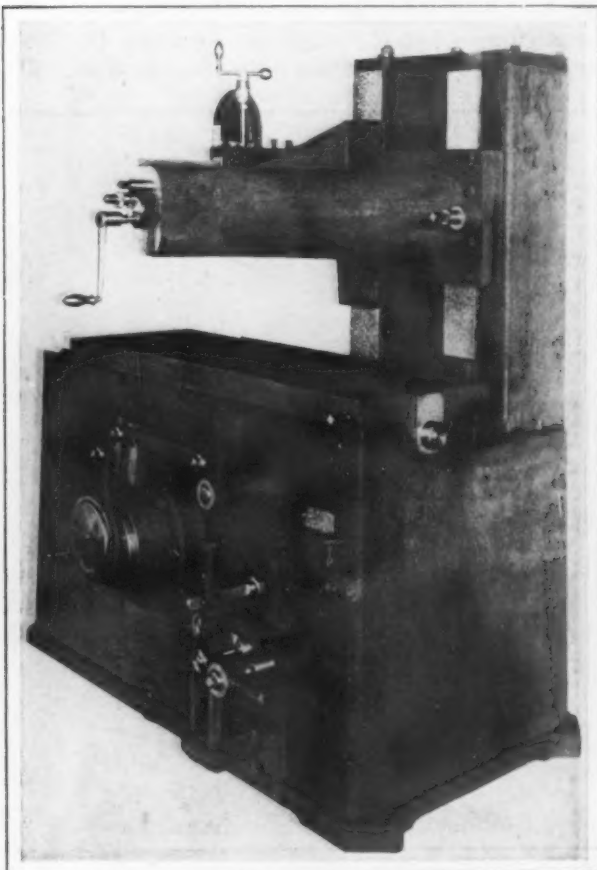
tached to the saddle, thus enabling it to be fed at any desired speed in either direction along the length of the bridge. Two angular brackets which are bolted to the jointing machine bed support the bridge at the ends or at any other convenient point and hold the grinding machine rigid. The grinding wheel is of the cup type and can be raised or lowered by a thumb screw. It is automatically fed until the required amount of material has been removed. A tension spring in the grinding wheel is relied on to maintain a constant uniform pressure on the wheel and thus prevent the knives from being overheated and burnt.

The grinder head is pivoted at the center and can be tilted to either side of the perpendicular and held in place against a stop, thus giving the same angle on either side. It is pointed out that each knife must be ground true to the bed as a positive stop keeps it in exactly the same position with reference to the grinding wheel.

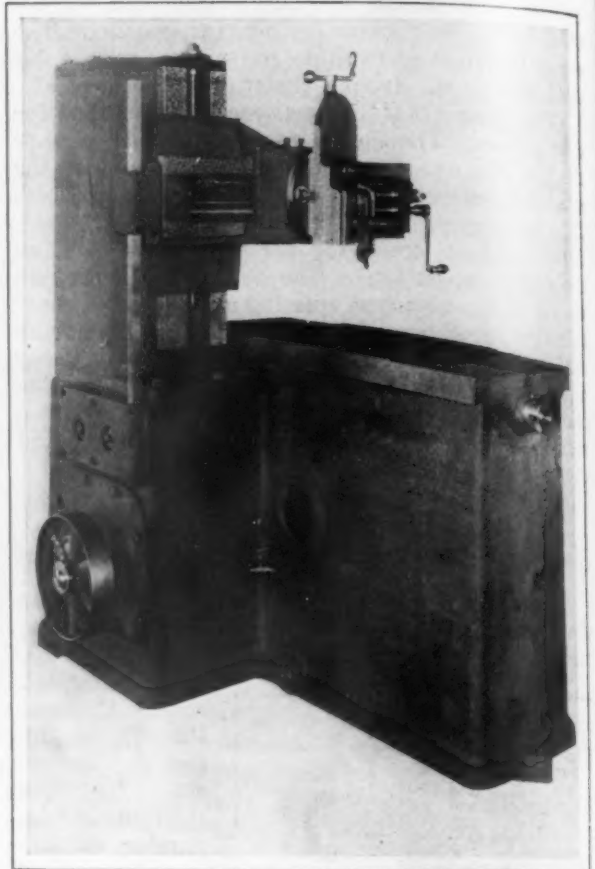
When the grinding machine is being used on a surface planing machine the angular brackets are reversed and held in place by fixed pins located in the planing machine frame. These pins fit in the holes in the foot of the bracket and once the adjustments have been made for each machine, it is only necessary to place the grinding machine in position on the supporting pins when it is to be used.

An Interesting Type of Shaping Machine

The Providence Engineering Works, Providence, R. I., has brought out a new shaping machine to combine in one unit valuable features of two standard machine tools, the shaping and the planing machine—the accuracy of the former and the speed and convenience of the latter. At first glance the machine appears to be a small open side planing machine, but the platen is driven on the standard principle of the shaping machine ram.



A New Shaping Machine Combining the Principles of Both the Planing and the Shaping Machine in One Tool



Another View of the Machine Showing the Details of the Planing Machine Features

So far as the cross rail and the tool head are concerned, the control of the feeds, horizontal, vertical and angular, is obtained in exactly the same way as with the ordinary planing machine, either by power or by hand. From a single-belt drive six geared speeds are obtained through a speed box giving from 10 to 100 strokes of the table per min. All the operating handles for both the power and hand feeds and speeds are within easy reach of the operator without it being necessary for him to leave his regular working position. The vertical handle at the lower right corner of the bed controls the quick change mechanism of the gear box while the bevel gearing is operated by the horizontal handle.

The use of the open side construction, it is pointed out, permits the planing of pieces which would not pass through the housings of an ordinary planing machine and also gives an unobstructed view of both ends of the work so that the cutting tool may be set to a line at the commencement of a stroke rather than upon its completion.

The following table gives the principal dimensions and specifications of this new machine:

Length of table stroke, in.....	24
Maximum horizontal feed, in.....	0.25
Maximum vertical feed, in.....	0.125
Horizontal travel of tool, in.....	19
Vertical feed of tool, in.....	6
Diameter of swivel head, in.....	14
Bearing of saddle on cross rail, in.....	14
Maximum vertical adjustment of cross rail, in.....	16
Travel of saddle on cross rail, in.....	19
Maximum distance between table and cross rail, in.....	16
Length of table, in.....	46
Width of table, in.....	16
Distance between table V's, in.....	11
Length of bed supporting table, in.....	53
Diameter of driving pulley, in.....	12
Face width of driving pulley, in.....	2 1/4
Speed of countershaft, r.p.m.....	450
Net weight of machine, lb.....	4,400
Domestic shipping weight of machine, lb..	5,200

For fastening work in position on the table three T-slots for 5/8-in. bolts are cut in the top

Locomotive Cylinder Planing Machine

The Cincinnati Planer Company, Cincinnati, Ohio, has brought out a new line of machines for planing locomotive cylinders. The machine illustrated is designated by the builder as the 72 x 72-in. size and has rapid power traverse to all the heads in any direction. All of the movements are independent of each other and can be operated whether the table is in motion or not. The machine is designed so that it can readily be converted into a standard tool whenever the need arises.

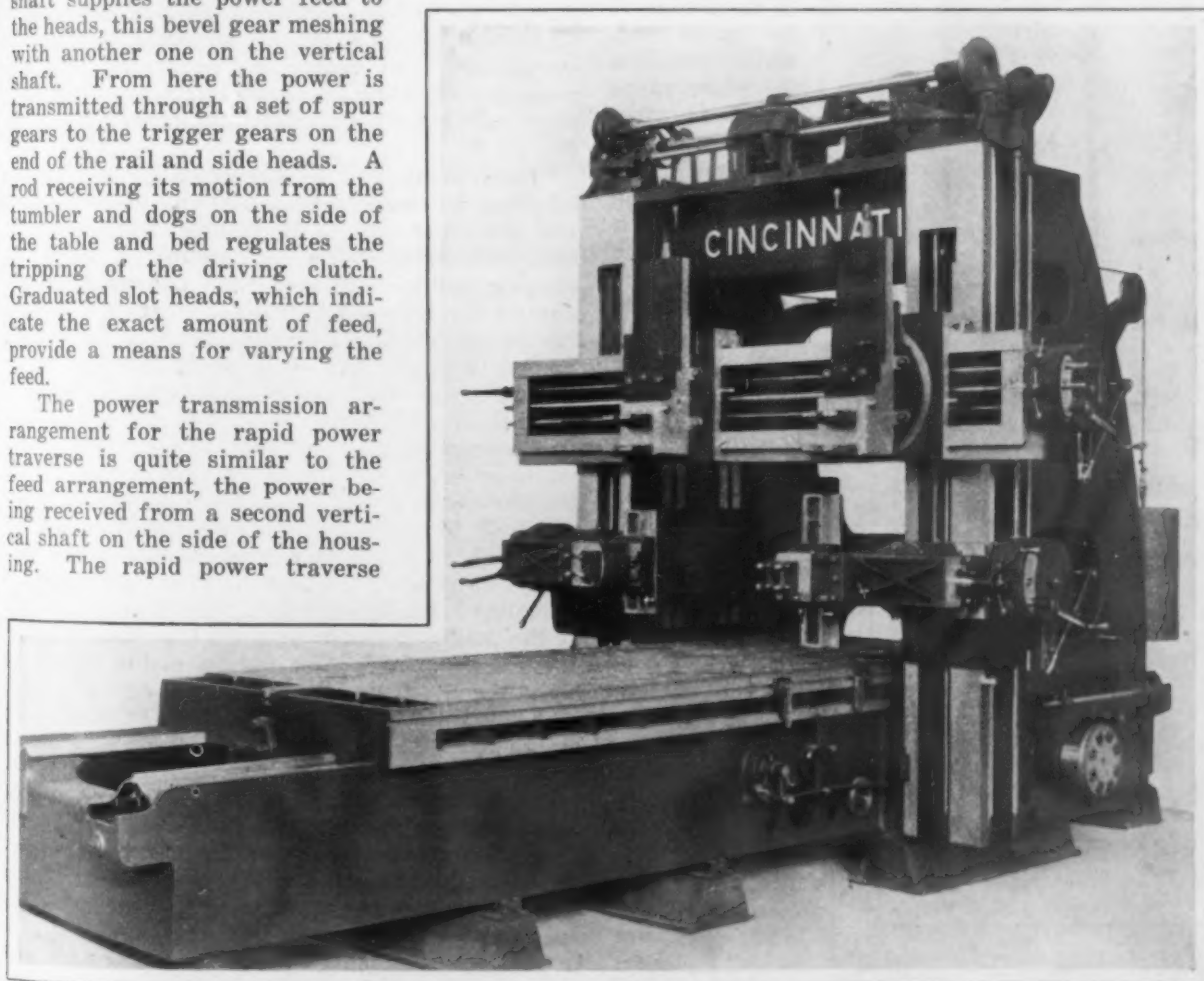
The motor, which is mounted on top of the housing, is used in four different ways, supplying power for driving the rapid power traverse and feed to the head, for elevating and lowering the cross rail and for driving the pump which lubricates the ways. The power for the horizontal rapid traverse shaft is transmitted through a pinion on the motor armature and a large gear on the shaft itself. This shaft also supplies power to the pinion driving the feed clutch and a gear located near the center of this shaft meshes with a pinion on the gear case of the elevating device. The power for raising and lowering the cross rail is transmitted in this way. The driving clutch which has a link motion to the bevel gear on the large horizontal shaft supplies the power feed to the heads, this bevel gear meshing with another one on the vertical shaft. From here the power is transmitted through a set of spur gears to the trigger gears on the end of the rail and side heads. A rod receiving its motion from the tumbler and dogs on the side of the table and bed regulates the tripping of the driving clutch. Graduated slot heads, which indicate the exact amount of feed, provide a means for varying the feed.

The power transmission arrangement for the rapid power traverse is quite similar to the feed arrangement, the power being received from a second vertical shaft on the side of the housing. The rapid power traverse

of the rail and side head are employed to reverse the direction of the rapid traverse.

Extra supports for the side head, which are used while planing locomotive cylinders, are a special feature of the machine. These heads have extra brackets which are bolted rigidly on the inside of the housing and support the slides while the frame fits, etc., are being planed. Adjustment for height is provided and it is possible to use the brackets in any position between the top of the head and the bottom of the cross rail. There is a sliding shoe, fitting the front face of the brackets with a dovetail upon which the cross slide fits. It is pointed out that this construction eliminates the twisting strains on the housing face, which are generally caused by the long, overhung slide and upward pressure of the tool. If it should be desired to convert the machine at any time into a standard tool, it is emphasized that this can be done quickly as the brackets are easily removable.

The annual report of Samuel M. Curwen, president J. G. Brill Company, shows that the total sales value of the combined output of the five plants owned and operated by the company for the 12 months ended December 31, 1913, was \$9,154,433.79. The combined profit for the year amounted to \$909,143.64. The ex-



A Recently Developed 72 x 72 In. Locomotive Cylinder Planing Machine Equipped with Rapid Power Traverse to All Heads in Any Direction and Having All Movements Entirely Independent

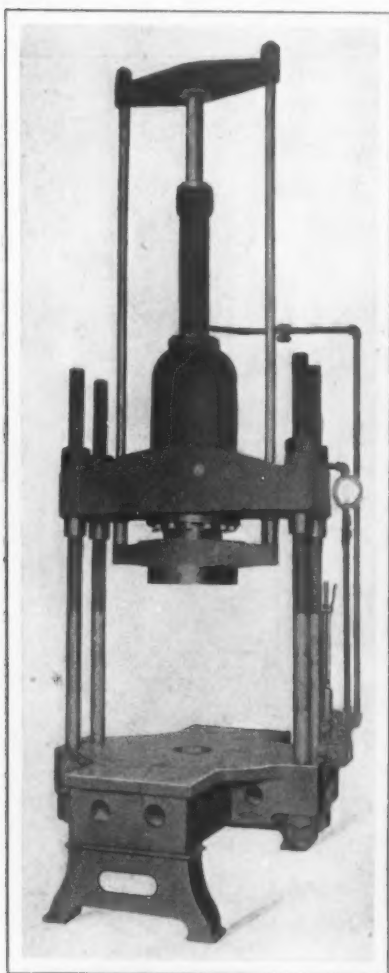
and the feed are controlled by the small handles on the end of the rail and side heads, the position of the handles regulating the engagement of one or the other, it being emphasized that in no case can both be engaged at the same time. Motion to the left engages the rapid traverse movement, while by turning the handles to the right the feed is engaged. The long handles at the back

pense of maintenance and upkeep, amounting to \$257,242.53, was taken from current earnings. There was set aside out of earnings, as an addition to the depreciation reserve, the sum of \$155,234.58; this total reserve now amounts to \$1,462,580.57. On February 9 the orders in process of execution amounted to \$1,781,000. Dividends were paid only on the preferred stock, amounting to \$320,600 on the \$4,580,000 issued. The total common stock is \$5,000,000.

Structural Steel Straightening Press

For straightening structural steel, bars and shafts, the Hydraulic Press Mfg. Company, Mt. Gilead, Ohio, has recently brought out a new design of 250-ton hydraulic press. It is also possible to use the machine for covering a wide range of work in machine shop service, it being pointed out that the press is particularly suitable for bending, forcing, forming, broaching, etc. The daylight or stock space of this press can be varied 28 in. and for that reason the pipe connections have swing joints.

Steel is employed throughout in the construction of the press and the strain rods are threaded on the upper end for one-third of their length and are provided with nuts adjusted to both the upper and lower sides of the cylinder bearings. There are T-slots in both the ram head and the press bed, for attaching bending blocks, forms or dies. The press bed has a maximum distance between the centers of 72 in. for handling work that is to be bent, an arrangement which, it is pointed out, permits an overhead crane to be employed in placing structural steel or other heavy material upon it.



A Hydraulic Press Designed for Straightening Structural Steel and Bar Stock and Work of a Similar Nature

There is a hole in the center of the press bed, which enables the press to be used for broaching work and also for forcing wheels on and off shafts, axles, etc. The diameter of the ram head is 20 in. and the stroke of the ram is 20 in. also. The pressure exerted by the press is 250 tons and the width of the working space is 26 in.

A four-way poppet operating valve is used to operate the press. A single lever having three positions is employed to control the movement of the valve and applies pressure on the main pressure ram and releases the

pressure on the return ram or the reverse, or holds the pressure to keep the rams in a stationary position at any point in their travel, according to the position of the lever. In this way it is possible to apply pressure to either the main pressure ram or the return ram working in the pull-back cylinder, and at the same time the water or oil used in operating the press is permitted to return to the pump reservoir from the cylinder on which the pressure is

released. If desired a five-way high and low pressure balanced poppet operating valve can be furnished.

When it is necessary to increase the daylight space from its minimum of 20 in. to any intermediate point up to the maximum of 48 in. a block is placed between the ram and the pressure bed. The upper nuts are then set to the required point and pressure applied, this action raising the cylinder to the nuts. For reducing the working space the block is still kept between the ram and the pressure bed, but the lower nuts are adjusted to the proper point, while the pressure is still applied. The pressure is then released, which relieves the strain on the upper nuts, this action lowering the cylinder to the point desired, after which the upper nuts are adjusted in place.

Boston's High-Pressure Equipment

The Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., furnishes more details of the contract it has secured for all the machinery and equipment for a central high-pressure fire pumping station for the city of Boston, Mass. The contract includes six 3000-gal. per min. 6-stage centrifugal pumps; six 700-hp., 6000-volt, 60-cycle motors; six 13,200-volt, 25-cycle, 800-hp. motors, complete with switchboard and controlling apparatus, and also necessary traveling cranes and all heavy piping and large valves for the complete equipment of the station.

Each pump will be connected by a magnetic coupling on one end to a 700-hp., 60-cycle motor and the other end to an 800-hp., 25-cycle motor. Under normal operation each pump is driven by its 60-cycle motor, furnished with current from the lines of the Edison Electric Illuminating Company. Should any mishap, however, occur to the 60-cycle supply, the pump can be instantly operated by its 25-cycle motor fed from the lines of the Boston Elevated Railroad Company.

The increased size of the 25-cycle motor is due to its speed being 732 r.p.m., while that of the 60-cycle motor is 702 r.p.m., these speeds being determined by the respective frequencies of the circuits. The motors have wound secondaries, and they do not start until the first point of the automatic controller has been passed. At this point the circuit of the magnetic clutch between the motor and the pump is completed. The 800-hp. motor will be the highest voltage wound secondary motor ever built—13,200 volts being the potential for which it is designed.

The high-pressure station is to be located between the Boston Commons and the Public Gardens. The business district is to be underlaid with special high-pressure water mains to be used for fire service only. In case of fire within this district, the alarm is sounded in the pumping stations and in the fire houses simultaneously. This permits the electrically operated pumps being started at once, and the pressure raised in not more than 45 sec. to 300 lb. per sq. in. all over the system of high-pressure mains. On arrival of the fire hose at the point of the fire, the hose can be connected directly to the special high-pressure hydrants, and water taken directly from the mains at sufficient pressure to avoid the use of fire engines. This is a system which is rapidly coming into favor in congested business districts, as it gives increased protection and makes it unnecessary to run through the dense traffic of such districts with heavy fire engines.

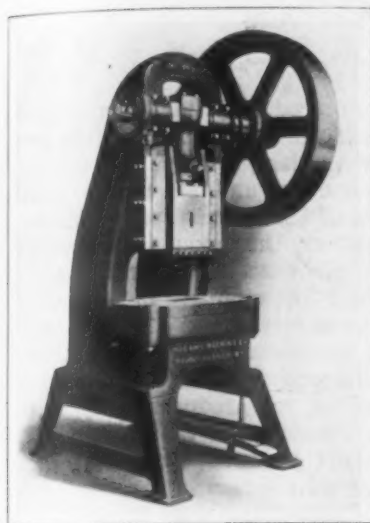
A New Line of Open Back Presses

For use in the manufacture of typewriters, locks, hinges, hardware specialties, sheet metal novelties, etc., the Max Ams Machine Company, Mt. Vernon, N. Y.,

has brought out a new line of open back presses that are built in eight different sizes. A feature claimed for the press is a rugged design calculated to give them the strength of the corresponding sizes of straight sided presses. In addition, it is possible to feed strip stock from the side and large sheets can be passed through the opening in the back.

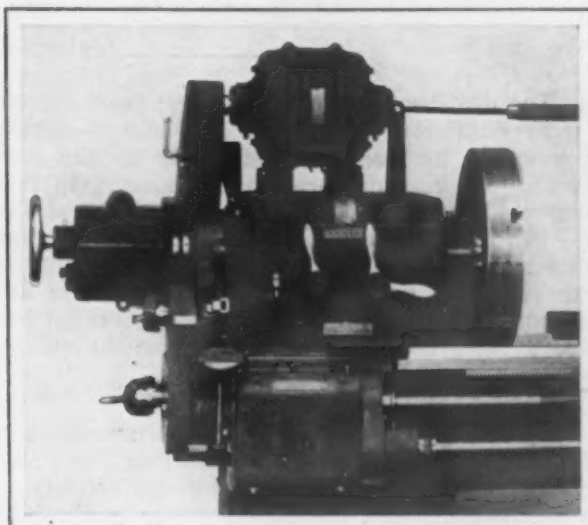
One of a Recently Developed Line of Open Back Presses Designed Especially for the Production of Parts for Typewriters, Locks, Hinges, Hardware Specialties and Sheet Metal Novelties

The die space and the opening in the back are both large. The slide has large wearing surfaces and a hammered steel forging is employed for the



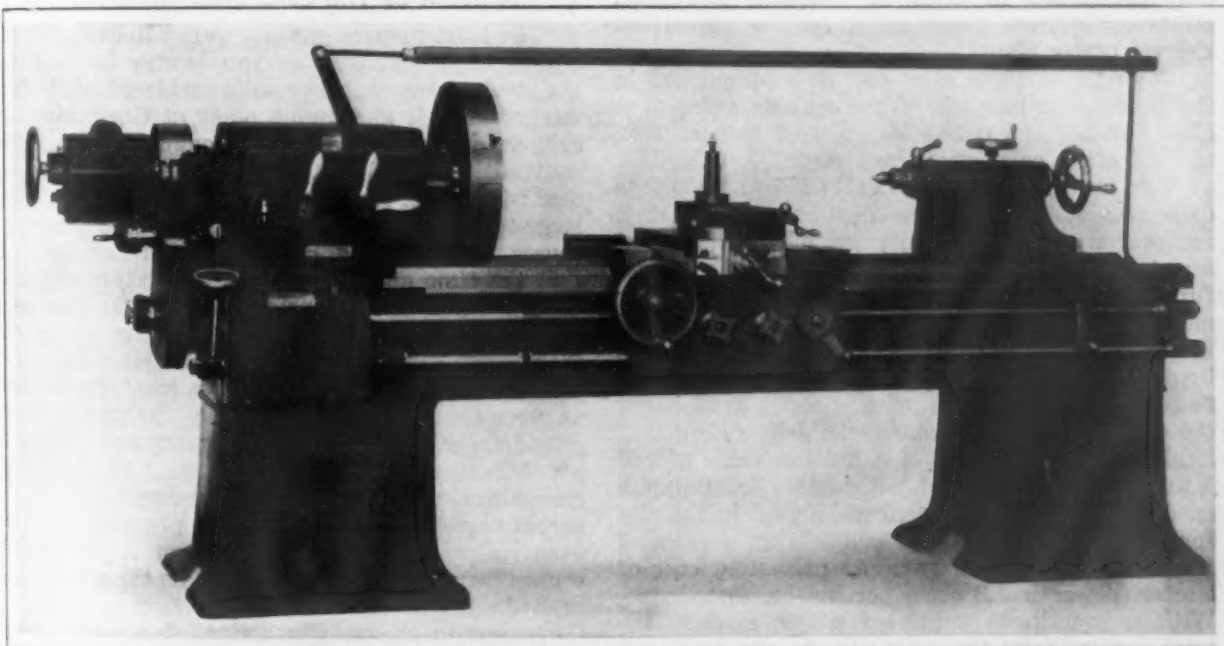
Geared Lathe with New Spindle Control

A new type of geared head stock lathe has just been put on the market by the Whitcomb-Blaisdell Machine Tool Company, Worcester, Mass. It is built in sizes ranging from 14 in. to 30 in. and is



Headstock of the Lathe Arranged for Motor Drive

designed to meet the demand for a simple, powerful and durable machine, arranged either for a single-pulley belt drive from a lineshaft, or for a direct-connected constant-speed motor. The special feature of the lathe is that the spindle may be



A New Type of Whitcomb-Blaisdell Lathe with a Geared Headstock

shaft. A cap clamp, flange or dovetail for holding the punches will be provided as required, and the patterns are constructed so that modifications in construction can be made to suit the requirements of individual cases.

Recent experience with vanadium in the foundry tends to demonstrate the possibility of making complicated iron cylinders and castings more successfully, the percentage of defective and leaky castings being largely diminished. The grain of the iron in which vanadium is incorporated is found to be much closer, the graphite being more uniformly distributed and in smaller and more even-sized flakes.

started, stopped or reversed by the operator at his working position without the use of a countershaft or reversing motor.

The shipper bar above the bed performs these operations, actuating the gearing and two friction clutches in the gear box located in the head stock. Changes in the spindle speeds are obtained through sliding clutches, arranged so that no two speeds can be engaged at the same time. The motor drive is of a very simple type but adjustable-speed motors having a range of 2 to 1 or 3 to 1 are furnished when desired. The general construction of this new tool follows the builder's standard line of lathes and embodies all of the conveniences found in them.

Wider Use of Coke-Oven Gas Advocated*

Where the Coke-Oven Engine Stands—For
Public Service Gas from Blast Furnaces Added,
Operating the Latter Simply as Gas Producers

—BY HEINRICH J. FREY†—

The evidence of statistical investigations made by E. W. Parker of the United States Geological Survey, is that only approximately 25 per cent. of the total coke produced in this country in 1912 was made in by-product coke ovens, whereas 75 per cent. was produced in beehive ovens. This entailed the enormous loss of over \$80,000,000 in non-recovered by-products, such as gas, tar and ammonia, without considering the substantial loss due to the non-recovery of benzol from the coal.

BLAST FURNACE AS A SLAGGING GAS PRODUCER

By taking advantage of the recent innovation of H. A. Brassert, blast furnaces are now able to insure fulfillment of a contract for the delivery of a specified uniform amount of power in times of business depression as well as activity. Brassert virtually transforms a non-active blast furnace into a huge gas producer, and gasifies in it, small coke, raw coal, and coke breeze, on the principle of a slagging type of producer, using open-hearth slag as flux. This has been very successfully demonstrated at South Chicago and Gary. This disposes of the argument that curtailment of pig iron and coke production in times of business depression militates against maintaining, say, a gas-driven electric power plant.

In order to show what can be accomplished in the practical utilization of the surplus gases of a blast furnace and coke-oven plant of modern size, the following calculations are made:

Two isolated blast furnaces, of 350 and 450 tons daily capacity each, are installed near a large city, together with a coke-oven plant of just sufficient size to furnish the necessary coke for these blast furnaces. Coking coals of proper quality for making good blast-furnace coke can be delivered for \$3 per long ton f.o.b. the furnace plant. The by-product coke is charged to the blast furnaces at \$4.25 per net ton, which price is about \$1.25 below the cost of standard beehive coke delivered in that locality. Coke-oven gas of a heating value of 550 B.t.u. per cubic foot, but not subject to minimum candle-power specifications, can be used in the city for domestic purposes and would bring a price of 12 cents per 1000 cu. ft. The prevailing cost of electric power is 1.2 cents per kw.-hr. distributed. With a practically unlimited power market, the total surplus from the blast-furnace and coke-oven gases of this plant can be absorbed by the established electric power company, which operates steam turbine power stations of approximately 300,000,000 kw.-hr. total output per year generated at a yearly use factor of about 38 per cent.

With such favorable local conditions, the total quantity of coke-oven gas can be used for domestic or power purposes, or both. To realize this, gas from some outside source must be used for under-firing at the coke ovens. Blast-furnace gas should not be used for this purpose in this instance, since this ideal gas-engine fuel can much more profitably

be utilized for the production of electric power. Producer gas made from small coke and coke breeze in revolving grate or slagging type gas producers would answer splendidly and should be used if sufficient quantities of these fuels are available. As a general rule, however, the amount of coke breeze does not exceed 7 per cent. to 8 per cent. of the total coke made, and this quantity is not sufficient to produce the necessary gas for under-firing. In this discussion, it was assumed that a mixture of raw coal and coke breeze is gasified in some type of mechanically-stirred gas producer equipped with apparatus for the recovery of by-products. This producer plant would be in operation at practically full output at all times, making this method of providing for under-firing very cheap and attractive. The question whether the total quantity of coke-oven gas produced should be marketed for community use, or only its rich portion, while the lean portion is used for power purposes in the natural state, or in admixture with blast-furnace gas, can be properly answered only when the quality of the coking coals is known and when the value of the coke-oven gas is correctly appraised.

POSITION OF THE COKE-OVEN GAS ENGINE

The blast-furnace gas engine has to-day attained a very high standard, as can readily be seen by the truly remarkable results achieved with the world's largest gas-engine plant at Gary; but the coke-oven gas engine, although mechanically equivalent to the blast-furnace gas engine, has to deal with a fuel of entirely different character. The large percentage of hydrogen in coke-oven gas causes an extremely rapid flame propagation, so that the time of combustion of a mixture of coke-oven gas and air is considerably shorter, and this combustion much more of an explosive character, than is the case with blast-furnace gas. The compression in coke-oven gas engines must, on account of these characteristic qualities of the fuel, be kept considerably lower than is customary and appropriate for blast-furnace gas engines. Costly experience has taught European gas-engine manufacturers to reduce the compression pressure in coke-oven gas engines to 110, and even to 85 lb. per square inch, depending somewhat on the percentage of hydrogen in the gas.

Owing to the snappy action of the gas, coke-oven gas engines are at times quite susceptible to back-firing and premature explosions. Effective cooling of gas cylinders, pistons, piston rods, etc., becomes, therefore, a very important matter on account of the intense heating of these parts. The absolute quantities of coke-oven gas consumed during one working cycle are comparatively small, even at full load, and perfect regulation of coke-oven gas engines is, therefore, not so easily accomplished as that of blast-furnace gas engines. Serious difficulties were encountered in the earlier days because it was found quite impossible to maintain satisfactory parallel operation, especially at fractional loads, of coke-oven gas-engine generators feeding into the same system. Ignorance on the designer's part was very largely responsible for these difficulties.

*Extracts from a paper read at the New York meeting of the American Institute of Mining Engineers, February 18, 1914.

†Third vice-president, H. Koppers Company, Chicago.

because gas ports and gas-valve areas were made far too large, and entirely out of proportion to the size of the air ports, since no attention was paid to the low specific gravity of coke-oven gas. Much larger quantities of gas than actually required at any specific load were thus caused to enter the gas cylinders, and these earlier engines nearly always operated on excessively rich mixtures. The obvious result was, after burning, destruction of exhaust valves, piston rods and cylinders, violent back-fires and vicious premature explosions, all of which caused extremely unsatisfactory commercial operation.

To-day the coke-oven gas engine has reached such a high state of perfection in Germany that it is second only to the blast-furnace gas engine in importance and serviceableness, with the qualification, however, that unit capacity and more particularly the rating must be conservative.

The latest coke-oven gas engines built by Thyssen & Co., of Muelheim-Ruhr, Germany, installed at Bonifacius colliery in Westphalia, are of the twin-tandem double-acting four-cycle type having four gas cylinders $47\frac{1}{2}$ in. in diameter, 51 in. stroke and develop at 94 r.p.m. about 5,000 b.h.p. Parallel operation is beyond criticism and the load factor of these engines is very high—from 90 to 100 per cent.—since peak loads are taken up by the blast-furnace gas-engine plant and the steam turbines. These engines were built two years ago and are probably the largest coke-oven gas engines in the world. The compression pressure is only 85 lb. and the maximum explosion pressure does not exceed 250 lb. per square inch. Each cylinder end is provided with three igniters. The gas consumption as measured by means of a large gas holder was found to be 12,000 b.t.u. per kw-hr. at 90 to 100 per cent. load. The over-all mechanical efficiency, including generator, is 82.3 per cent. at that load.

The overwhelming majority of gas-engine manufacturers in this country restrict the capacity of coke-oven gas engines to about 700 or 750 b.h.p. per double-acting cylinder at present. This prudent and conservative policy on the part of American gas-engine builders shows excellent judgment. The coke-producing industries should encourage this spirit and assist the manufacturers by installing coke-oven gas engines to about 700 or 850 b.h.p. per has lain idle altogether too long.

It should be remembered that the presence of sulphur in coke-oven gas in the form of sulphuretted hydrogen and carbon bisulphide was the cause of very serious troubles before it was learned how to combat its influence. The slightest water leak in the gas cylinders from defective pistons or water-cooled exhaust valves resulted in serious corrosion of all finished parts, and particularly of piston rings, piston rods, and metallic packing. This corrosion was caused by sulphuric acid formed by the combination with oxygen and water of sulphur dioxide, resulting from the combustion of sulphur in the gas. Instead of striking at the root of the evil by proper sulphur purification, and by prevention of water leaks, attempt was made to cure the trouble by resorting to building materials which would not be attacked by sulphuric acid.

Considerable progress has been made in recent years in designing sulphur cleaning plants which eliminate nearly all of the sulphuretted hydrogen, although no practical means has so far been discovered to separate carbon bisulphide from the gas. Gas-engine manufacturers in Europe are, however, willing to guarantee satisfactory and continuous operation of gas engines supplied with purified coke-oven gas containing as much as 1.25 gr. of sulphur compounds in one cubic foot.

Naphthalene which is deposited by the gas particularly in cold weather easily obstructs pipe lines and valves. This also has been the cause of much annoyance. If benzol is recovered from the gas no trouble from naphthalene deposits can occur, since it is absolutely necessary for efficient benzol recovery to extract the naphthalene from the gas. In plants where benzol is not recovered, it happens not infrequently that the gas pipes, etc., have to be steamed out from time to time in order to dissolve the naphthalene, which otherwise accumulates in the piping and on the valves, until the output of the power plant is noticeably reduced. Incidentally benzol recovery, in connection with by-product coke-oven plants, improves gas-engine operation owing to the elimination of certain hydrocarbons, and because the heating value of the gas is reduced about 5 per cent. Coke-oven gas used for power purposes, or as fuel in a steel plant, does not require any illuminating properties; the recovery of the benzol from the gas for sale offers very attractive financial possibilities and yields an exceptionally handsome profit on the investment.

A straight-forward acknowledgment of the salient difficulties with earlier coke-oven gas engines coupled with an account of the remedies which eliminated the trouble in subsequent installations can only have a beneficial effect upon the cause of the coke-oven gas engine. The meager experiences had with one or two earlier coke-oven gas-engine installations in this country are in the author's judgment not sufficient premises to argue for or against the use of coke-oven gas for gas-engine purposes and to draw conclusions of any value.

DIRECT-MILL DRIVING WITH GAS ENGINE

The application of the coke-oven gas engine for direct driving of rolling mills is to the author's knowledge not illustrated by a single installation abroad or in this country. Its absence from this field is largely explained by the geographical separation of coke-oven plants and rolling mills. The load conditions of rod, wire, and sheet mills are not unfavorable for direct gas-engine drives, since they impose upon the prime mover, neither violent nor excessive load variations. The average power demand of such mills is moderate, so that frequently single tandem gas-engine units are fully capable of performing the work. The direct-connected rolling-mill gas engine for light continuous mills does not require much overload capacity, and can therefore be suitably rated to operate at a high load factor. The gas consumption is then very low and the thermal efficiency high. The result is a substantial fuel economy per ton of finished product, compared with steam engine, steam turbine or electric-motor drives.

The principal advantage of direct gas-engine mill drives is, of course, the saving in cost of installation and operation. Such direct drives do away with costly combinations of electric central station, transformers, transmission lines, mill motors and the requisite expensive auxiliaries. They are, moreover, not attended by the multiplicity of efficiency losses on account of the roundabout way of generation, transformation and transmission of energy, which are handicapping electric mill drives.

In our country the installation of by-product coke-oven plants located near blast furnaces and steel mills is rapidly becoming distinctly American practice. Blast-furnace gas of low heating value and great volume does not lend itself readily to economical long-distance transportation through pipe lines, because the first cost of compressor equipment and pipe line would alone be prohibitive,

but the transmission of coke-oven gas for illuminating purposes through distances of 30 and 40 miles is not unknown in this country, and the expenses incidental to the installation and operation of booster stations are moderate.

EMPLOYING GAS MIXTURES IN ENGINES

No matter what objections could justly or unjustly be raised against the use of coke-oven gas for direct power generation in modern gas engines, none of these can possibly apply on the use of a mixture of blast-furnace and coke-oven gas. The practice of combining blast furnaces, steel mills, and coke-oven plants in one locality, gives the American iron and steel master an enormous advantage over the majority of his European competitors in the matter of rational utilization of the available surplus gases. It is evident what truly ideal conditions would obtain in such combined plants if only one kind of gas fuel were used for all requirements of the plant. A gas mixture in suitable proportions of blast-furnace and coke-oven gas would fulfill the most exacting specifications which could be imposed.

There would not be any difficulty in maintaining a heating value of the gas mixture to all intents and purposes uniform, if this task were committed to the action of automatic devices. One, or if necessary, several automatic recording gas calorimeters—for instance of the Smith type—could be equipped with a maximum-minimum electric-contact attachment, corresponding to the permissible maximum and minimum heating value of the gas mixture. These calorimeters would control—by means of relays and electric motors—gate or butterfly valves, arranged in the coke-oven gas pipe at, or near, the point of connection with the blast-furnace gas main. The suggestion of using a gas mixture for gas-engine purposes is by no means new or original, with the exception perhaps of the proposed method of controlling the heating value automatically. Gas-engine plants using such mixtures have been in very successful operation abroad for a number of years. A mixture of one part of coke-oven gas of 500 b.t.u. and of 15 parts of blast-furnace gas of 100 b.t.u. would have a heating value of 125 b.t.u. per cubic foot.

The fact that the gas mixture is supplied by two practically independent sources constitutes in itself a safety factor of no little value. At times of momentary shortage of either ingredient the regular output of electric power would be maintained by admitting to the engines a mixture leaner or richer than standard. The possibility of using in the engines, producer gas made by one of the existing blast furnaces operating according to Brassert's gas-producer principle is an adequate safeguard against the influence of a curtailment of pig iron and consequently blast-furnace gas production brought about by a business depression. Blast-furnace producer gas has about the same heating value as the gas mixture and its composition by volume is approximately as follows:

Blast-Furnace Producer Gas	
	Per cent.
CO	34.0
CO ₂	1.6
H	2.9
CH ₄	1.0
B.T.U.	126

The percentage of hydrogen in furnace producer gas is considerably smaller than in the standard gas mixture. The former gas can, therefore, be substituted for the mixture with impunity. The higher percentage of carbon monoxide in the producer gas will counterbalance the reduction in hy-

drogen to a large extent, as far as the effect upon gas-engine operation is concerned. It can thus be expected that the change from one gas to the other can be made even without important readjustments of valve and damper setting on the gas engines.

Sawdust as a Fire Extinguisher

A considerable number of experiments were conducted in the fall of 1912 by the inspection department of the Associated Factory Mutual Fire Insurance Companies, Boston, in extinguishing fires in lacquer and gasoline in tanks with sawdust. The results, which were satisfactory, showed that sawdust is an excellent extinguishing agent for certain volatile liquids, especially those of a viscous nature, and were presented in a paper read at the recent annual meeting of the American Society of Mechanical Engineers by Edward A. Barrier, Boston, who is identified with the inspection department.

The efficiency of the sawdust for this purpose, he explained, is undoubtedly due to its blanketing action in floating for a time upon the surface of the liquid and excluding the oxygen of the air. For that reason its efficiency is greater on viscous liquids than on thin ones, as it floats more readily on the former than on the latter. The sawdust itself is not easily ignited, but if it does it burns without flame and the temperature of the burning embers is not sufficiently high to reignite the liquid.

In making tests, the liquids were placed in three tanks of different sizes, all having the same depth, 16 in. The sawdust was applied with a snow shovel having a large blade and in every case the fires were extinguished readily, especially in the two smaller tanks, which were about the same size as those ordinarily employed for lacquer in manufacturing establishments. It was found that the character of the sawdust, whether from soft or hard wood, was not important and the amount of moisture contained in it was not a factor also so that the drying out of sawdust when kept in manufacturing establishments for a time would not affect the efficiency.

It was also found that adding of bicarbonate of soda increased the efficiency of the sawdust by shortening the length of time and decreasing the amount of material required to extinguish the fires. A further advantage of the addition of bicarbonate of soda is that it decreases the possible danger resulting from the presence of sawdust in manufacturing plants, as it would be difficult, if not, impossible, to ignite the mixture by a carelessly thrown match or any other ready source of ignition. While the efficiency of the sawdust is greatest on viscous liquids, such as lacquers, heavy oils, japan, waxes, etc., in the tests referred to, fires were extinguished in gasoline contained in the smallest of the three tanks, measuring 12 x 30 in., and also when spread upon the ground. In the larger tanks it was found that the sawdust or the mixture of bicarbonate did not work as well as the sawdust sunk before the entire surface could be covered and the exposed liquid reignited.

The prices paid for rails of Australian manufacture by the Victorian State Railways, in order to keep work in Australia, is shown by the following: Orders for 9026 tons were placed with the Lithgow Iron Works, New South Wales, at £8 15s. (\$42.58) per ton; also for 738 tons of fish plates at £10 17s. 6d. (\$52.92) per ton. The prices for the remainder of the requirements, placed in England, were: 18,053 tons of 80-lb. steel rails at £8 4s. (\$39.90) per ton and 1477 tons of fish plates at £10 8s. (\$50.61) per ton.

MUTUAL ACCIDENT INSURANCE

Description of a Plan Operated by an Employer in a State Without a Compensation Law

Workmen's compensation laws have thus far been adopted in about half of the States, but the time seems some distance in the future when every State will have a law of this kind. For the benefit of employers in the latter group, the plan used by a large metal-working concern in a Middle Western city is worthy of description as it provides for injured men without placing a burden on the business. As this plan has worked for nearly 15 years in the plant under consideration, it may be regarded as having stood the test of time reasonably well.

INSURANCE FUND MAINTAINED BY EMPLOYEES

The scheme provides for a mutual insurance fund maintained by and for the employees, but collected and administered by the company. When a man enters its employment, he signs an application for membership in the insurance organization, under the provisions of which he relinquishes his interest in the fund if at any time he leaves the employment of the company. He agrees to pay 1 per cent. of his wages to the fund, in return for which he is to get a weekly benefit amounting to 50 per cent. of his earnings during the time that he is unable to work. The maximum time limit during which injured men may participate in the fund is 52 weeks.

A death benefit of \$250 is provided. This may seem small, but there are two reasons why the indemnity was limited to this amount. The first and most cogent is that the weekly benefits are rather numerous, and take so much of the revenue of the fund that little is left for use as a death indemnity. To provide any more would necessitate increasing the assessment, and this is not regarded as desirable. On the other hand, the fund is not intended to furnish full indemnity for the loss of life or time, but simply to provide money for the relief of pressing requirements. The amount to be paid in case of death is enough to provide for funeral expenses and leave a little besides.

The operation of the fund during the years that it has been in effect has been successful in every way. Instead of an injured man having to seek an advance payment of wages or a contribution of any kind from his employers, he knows that he can claim, as his right, the amount provided through the assessments collected from him. Consequently his self-respect is increased, if anything, and his independence of spirit is not broken.

The company provides medical attendance, having several physicians regularly employed for this work, so that the victim of an accident is not at expense in this regard. The payments which he receives from the insurance fund, while not large, are sufficient to provide for the wants of his family, and yet are small enough to furnish an incentive to return to work as soon as possible. A man accustomed to earning \$18 or \$20 a week can get along, at a pinch, with \$9 or \$10; at least he can keep the wolf from the door and satisfy in part the demands of the grocer and the rent collector; but he has few inducements to extend his term of idleness beyond the time absolutely necessary for his recovery.

It has been suggested that the company could relieve itself of the trouble of handling the fund by turning the premiums collected over to an accident insurance company, which in turn would issue a

blanket policy covering the whole plant. This, it is believed, would not work as well as the method described. In the first place, the net amount available for insurance would not be so great as at present, since the profits of the underwriters would have to be provided for; and, second, satisfactory adjustments probably would not be made as readily, nor payments provided as constantly, as at present. The question of fact is never at issue with the employer handling the insurance; it can be determined at once just what the accident was and how it happened, and immediate relief is at hand.

HOW THE PLAN IS OPERATED

The company which operates this plan collects the money from its employees and transfers it to a separate account devoted to the insurance fund. Books are carefully kept on the administration of the money, so that the company is ready at all times to make an accounting, if this should be necessary. Occasionally a discharged employee, disgruntled for one reason or another, has attempted to collect what he describes as "his share" of the insurance fund; but invariably the court has held against such attempts, both because the claimant has had the benefit of the insurance, and because he had originally agreed to waive his claim in the fund in the event of the termination of his employment for any cause.

The operation of the accident insurance fund does not affect the matter of damage suits to recover indemnity from the company on account of personal injuries. In fact, officers of the company do not believe that such suits are any less numerous on account of the operation of the fund. The legal situation remains as it has always been, though the fact that the victim of accident has not had to suffer hardship because of lack of money would seem to suggest the probability of less aggressive action to recover damages.

The head of the company says that in the event of a compensation law being adopted by the State in which his plant is located, the insurance fund would probably be discontinued. As long as conditions remain as they are, however, it will serve the company and its working force, being in this sense mutually beneficial.

Recent Improvements in Hack Saw Machines

E. C. Atkins & Co., Indianapolis, Ind., have added two features to its Kwik Kut hack saw machine, which was illustrated in *The Iron Age*, September 28, 1911. These are a device for guiding the blade to insure an absolutely accurate cut and a hydraulic arrangement for regulating the blade pressure. The first is a slotted vertical bar, through which the blade passes and this arrangement is relied upon to give a straight cut. The hydraulic attachment lowers the saw frame to the work gradually, which enables the operator to exert any desired degree of pressure and thus relieve the strain on the saw teeth instead of having the entire weight of the arm bear on the cut. The pressure applied to the saw arm by this arrangement can be regulated to any desired degree by manipulating a simple cock.

The Mitchell-Lewis Motor Company, Racine, Wis., announces that it has sold its wagon plant to an Eastern syndicate which has organized the Mitchell Wagon Company with a capital stock of \$500,000. The wagon plant has hitherto been known as plant No. 2 of the motor company and was the original site of the present consolidated Mitchell-Lewis business.

American Institute of Mining Engineers

Contributions on Iron and Steel a Conspicuous Feature of the Annual Meeting Last Week in New York City

An unusually large number of papers, including varied contributions on iron and steel questions, was one of the features of a notable meeting held last week in New York City by the American Institute of Mining Engineers. It was the annual meeting, as noted last week, in enumerating the officers elected, and so numerous were the papers that simultaneous sessions had to be held. On both morning and afternoon of Wednesday, February 18, there was an iron and steel session and also sessions at the same time on mining law. On Thursday morning and afternoon was a session devoted to petroleum and gas and a separate session in the morning on mining geology and one in the afternoon to receive a number of papers on what may be called miscellaneous topics. In all there were some 68 papers. A brief report is given in the following of the iron and steel sessions of Wednesday.

EFFECT OF OXYGEN IN CAST IRON

The paper which attracted the most attention on the Wednesday morning session of the iron and steel section of the Institute was that presented by J. E. Johnson, Jr., on the "Influence on the Quality of Cast Iron Exerted by Oxygen, Nitrogen and Some Other Elements." A large portion of this paper was published in *The Iron Age* February 19, 1914. After Mr. Johnson had presented a very brief abstract together with the throwing of various photomicrographs on the screen, an animated discussion followed in which considerable criticism of the author's startling conclusions was manifest. Dr. Richard Moldenke expressed his intense interest in the paper and also the opinion that while much in the conclusions was true, still his own conclusions from the data presented were directly the opposite of those of Mr. Johnson. While the presence of much oxygen in conjunction with 4 per cent. carbon was metallurgically almost unbelievable, he considered the oxygen in such cases to exist as Fe_2O_3 , which always meant bad iron. It was his opinion that oxygen in such cases gives a deeper chill or makes the iron set faster, thus preventing the formation of the large flakes of graphite. He called attention to what he considered a weakness in the table so far as the percentages of combined and graphitic carbon are concerned. He thought the explanation of the superiority of the oxygen irons might lie in a relatively higher combined carbon, if the same results were secured by drillings taken in a manner which he considered more accurate than that of the author; that is, by drilling down through the length of the bar and using the total as a sample. As to the matter of deoxidation, Dr. Moldenke believed that this reaction took the chill out of the iron. It had been his experience that by remelting white irons with the addition of either vanadium or titanium he had been able to raise the strength three times easily.

Henry D. Hibbard, Plainfield, N. J., expressed his interest from a steel point of view and he stated that often even good steel was made from poor iron, analogous to good iron from spongy No. 6 and also poor steel from iron of good analysis. He thought that the manganese in iron, coming as it often does from the ore, increased the solubility of carbon

and thereby tended to produce a white iron. It was recognized that powdered ferromanganese was often added to reduce the depth of chill.

Dr. Henry M. Howe, Columbia University, expressed the belief that oxygen tends to decrease the size of the plates of graphite, and William R. Webster, Philadelphia, asked what the difference was between semi-steels and Mr. Johnson's irons, especially as to the effect on low and high carbon contents.

Prof. Albert Sauveur, Harvard University, who occupied the chair, stated that while Mr. Johnson's paper presented puzzling facts nevertheless doubts existed as to the real cause of the phenomena. He questioned whether a difference in oxygen, so slight in his opinion, could be the cause of such increase in strength. He did not believe it possible and was open to more conclusive evidence. But even granted that the author's conclusions were true, he did not feel that he had proved his case and that the most that could be conceded was that good irons have more oxygen, which is not necessarily the cause for their superiority.

Bradley Stoughton, secretary of the Institute, was of the opinion that Mr. Johnson's analyses were convincing, even more so than any judgments based on inference. There is no doubt that where oxygen is present a better microstructure is shown which might possibly be explained by the oxygen throwing the eutectic point to the right in the iron-carbon diagram. The question of poor steel from iron of good analysis had been a part of his experience, but the explanation had remained more or less a mystery.

The important question of the method of formation of the graphite was raised by Prof. William Campbell, of Columbia University. It was possible that the strength might be explained by an indirect separation of graphite as contrasted with the weaker graphite which separates directly from the molten iron.

R. H. Sweetser, Easton, Pa., president of the Thomas Iron Company, testified as to his experience with reference to the question of bad steel from iron of good analysis. When he was making iron for the Bessemer plant at the Lake Superior Iron Corporation, complaints often came to him that certain iron was the cause of bad steel. While the analysis of this iron appeared normal, at times the graphite and kish were very high, especially the latter, so much so that it flew about in the air and large flakes of it were found to be largely silicon and carbon. It might have been due to making iron with a soft coke.

In reply to some of the speakers Mr. Johnson stated that he would take up the various points more fully in a written discussion. However, he would say that experience subsequent to the completion of this paper was to the effect that he had blown 1 per cent. silicon iron in a converter until thoroughly oxidized, that he had then mixed it with 2 per cent. silicon iron and re-blown. The first iron showed a strength of 2500 lb. and the second 3800 to 4200 lb. with an oxygen content of 0.042 per cent. The iron was saturated with oxygen. He had analyzed samples of the best cold blast charcoal irons and had found 0.06 per cent. oxygen.

the same as in the warm blast irons and as in the irons he had made.

WHAT TRANSPIRES IN RUPTURING STEEL

A paper on the "Plastic Deformation of Steel During Overstrain" was presented in abstract by the author, Prof. Henry M. Howe. He called attention to the fact that rupture in steel was due to plastic deformation; that when the stress took place within the elastic limit no deformation occurs, but if it took place in excess of the elastic limit a slip occurs in the metal and a decided plastic deformation takes place and net work has been done leading to the rupture of the steel. The paper dealt with the metallographic explanation of the mechanism of this mode of rupture. The author showed photomicrographs to demonstrate the explanation of the rupture as dependent on the extent of the deformation of the various layers or crystals of pearlite, cementite and ferrite and their consequent weakening.

In the discussion the chairman, Professor Sauveur, expressed his pleasure and gratification in being able to call on Professor Carpenter of the Royal School of Mines, London, England, whom he considered it an honor to have at the meeting. Professor Carpenter, after expressing his admiration of the thoroughness of the paper and his interest in the subject, said that it had been shown in England that besides the slipping there is a transformation, a rubbing of the crystals which produces a vitreous condition enclosing certain crystals, after which a breaking occurs. He also stated that he had found difficulty in etching such structures, due possibly to this amorphous vitreous condition, and he asked whether others had experienced any such difficulty. Professor Howe in the discussion expressed his admiration of the wonderful theory of the liquid state due to rubbing of the crystals and the final amorphous vitreous state and said it possibly explained why a slip should start and then stop.

Professor Sauveur presented an abstract of his paper on "Notes on Some Heating and Cooling Curves of Professor Carpenter's Electrolytic Iron." This was discussed by Professor Carpenter, of London, and by Professor Howe, the relation of the various alpha, beta and gamma irons and their solution one in the other being touched on.

MAGNETIC PROPERTIES OF MANGANESE STEEL

Prof. Joseph W. Richards, Lehigh University, South Bethlehem, Pa., presented by title the paper "Research with Regard to the Non-Magnetic and Magnetic Conditions of Manganese Steel," by Sir Robert Hadfield and Prof. B. Hopkinson, exhibiting some pieces of manganese steel whose magnetic properties had been increased by heating. The important part of the paper was to the effect that by heating manganese steel from 400 to 550 deg. C., it attained a magnetism which was 44 per cent. of that of iron; that in the same bar it has been possible to produce one portion absolutely non-magnetic and the other portion by heat treatment so magnetic that a magnet would easily lift it. The authors were of the opinion that this magnetism and its accompanying hardness were not explainable by the allotropic theory. In the discussion W. S. Potter, Alloy Steel Forging Company, Pittsburgh, raised the question as to the carbon content of the alloy after heat treatment and stated that in annealing a sheet of manganese steel containing 1.17 per cent. carbon, he had found only 0.65 per cent. carbon after the treatment. Professor Sauveur could not agree with the authors that allotropic was not an explanation of the effects. He found

the produced magnetism a support of the allotropic theory, as did also Professor Howe.

HEAT TREATMENT OF STEEL CASTINGS

The paper on "The Heat Treatment of Steel Castings," by C. D. Young, O. H. D. Pease and C. H. Strand, which is published in this issue of *The Iron Age*, was presented by Mr. Pease. The discussion was participated in by John H. Hall, consulting engineer, New York, and Edwin F. Cone, of *The Iron Age*, New York. Mr. Hall touched on the growing importance of water treatment of certain classes of steel castings but expressed the opinion that one hour was an insufficient time for heating to remove ingotism. And as to re-heating in a bath of lead, etc., he thought this in most cases impracticable from a commercial point of view. This could be done better by heating slowly in a furnace properly regulated. He said that shock tests were better when the grain was highly refined as in quenched specimens.

Mr. Cone called attention to the table as being a misleading presentation of commercially annealed castings, it having been his experience that it was rare that such castings presented physical qualities as poor as those tabulated. He emphasized that everything depended on the location of the piece of steel from which the test was taken and asked the authors how these were selected. He also called attention to the fact that the tensile strength did not correspond with the chemical composition in some cases and that none of the commercially annealed tests was truly representative of the metal incorporated in the bolsters, whether properly or improperly annealed. As to the heat-treated tests, while these were interesting they were rather disappointing in their ductility and especially in their elastic ratio. The speaker said it had been his experience that equally as good and better tests had been and were now commercially obtained by air tempering, tests having a high ductility with an elastic ratio of 60 to 65 per cent., depending on the steel and its method of manufacture, whether acid or basic, etc.

The paper on "Iron Ore Deposits Near Hong Kong, China," by C. M. Weld, New York, was not presented owing to the illness of the author.

The final paper of the Wednesday morning session, "Manganese Steel with Special Reference to the Relation of Physical Properties to Microstructure and Critical Ranges," by W. S. Potter, Alloy Steel Forging Company, Pittsburgh, was presented by the author together with a large number of photomicrographs shown on the screen. The paper covers results of a vast amount of work and is highly technical. Various tables show the effect on physical properties at definite temperatures with data as to the microstructure. The lateness of the hour militated against any discussion of this important subject, though Henry D. Hibbard stated that he hoped to present something in writing later.

The first paper of the Wednesday afternoon session in charge of the Iron and Steel Committee was by Capt. Robert W. Hunt on the "American Steel Rail Situation," contributing a valuable table of the practice of rail rolling mills, which table is reproduced elsewhere in this issue.

MANGANESE STEEL RAILS

The second paper was by Sir Robert Hadfield, entitled "Manganese Steel Rails." It referred to a paper the author read before the International Engineering Congress in Chicago in 1893, discussing the production of forged and rolled manganese

steel, and it explained that although no difficulty was experienced at that time in making manganese steel in various forms, sufficient encouragement to introduce these products, on a large scale, was not then obtained from the users, on account of the high expense. The paper mentioned also the manganese rails rolled in 1907 for the underground railroad of Paris. As a result of the experience on a severe curve at the Bastille station, it has been estimated that the rails will remain in service for six or seven years before being worn out while ordinary steel rails have to be replaced in less than a year.

The paper was discussed by W. S. Potter, who explained that from 1901 to 1907 inclusive there was developed in this country a method of heating manganese steel ingots for rolling, which instead of being limited to a range of temperature, which, according to the best information as to the Sheffield practice, was from 850 to 950 deg. C., enabled the operator to go to 1150 to 1250 deg. C. in the heating of the ingots. The result was a soft, ductile ingot, corresponding to the ductility of a 0.20 per cent. carbon steel ingot. In 1912 the Edgar Allen Company, he continued, was still selling manganese steel rails at approximately \$250 per ton. In 1913 this company took license under his English patents and immediately reduced the price on manganese steel rails to approximately \$125 per ton. The American price, he added, has been \$80 per ton for several years.

GOOD PERFORMANCE WITH TURBO-BLOWING ENGINE

One of the papers which aroused more than the usual discussion was presented by S. G. Valentine, who gave figures to show that with the General Electric turbo-blower used for the blast at the furnace of the Empire Steel & Iron Company at Oxford, N. J., only 41.7 cu. ft. of air was supplied per pound of coke. The figure is based on 6 mo. operation with an average coke consumption of 2147 lb. per ton of pig iron. The maximum air consumption is given as 43.5 cu. ft. per pound of coke and the minimum 39.5. He suggested two explanations for the low amount of air, one that the usual reciprocating blowing engine delivers less than the quantity it is credited with, and the other that the ordinary furnace produces more carbon monoxide than is needed to abstract oxygen from the charge. The ores used are about 85 per cent. magnetites, under 2 in. in size and much of it granular. The author held that the continuous stream of air obtained with the turbo blower was conducive to regularity of action.

J. E. Johnson, Jr., was not disposed to take the figure as final, emphasizing that it is about two-thirds the quantity theoretically required, and he suggested that it would be desirable to have more definite knowledge of the calibration of the blower from which the air deliveries were obtained. Karl Nibecker, steam engineer of the Youngstown Sheet & Tube Company, thought that a calibration of such a blower connected to a furnace, if possible, might show different results from a calibration discharging into a tank. As regards the economy of the steam-turbine-driven turbo blower, he believed the reciprocating blowing engine requires the less steam but it might have to give way when considering the saving in buildings, foundations and the like. Professor Richards, who presided, mentioned that a valuable feature of the turbo blower lay in its delivering a constant amount of air against a variable pressure, while the ordinary blowing engine gave the least air when needed most. He hoped humidity variation might sometime be compensated.

CLEANING BLAST FURNACE GAS

A comprehensive paper on gas cleaning at the Duquesne furnaces was presented by Ambrose N. Diehl, superintendent of blast furnaces, Carnegie Steel Company, Duquesne, Pa. The paper is too long to reprint at this time, but some idea of its scope may be gained from a brief review of it. It gives an analysis of the gas delivered to the gas engines by months for one year; it gives in detail the analysis of the flue dust and the character of the material recovered from the different cleaning apparatus; it describes the equipment at Duquesne; gives the results of operations, including a standard form for a gas washer test, and tabulates in detail the cost of cleaning the gas. For stove and boiler purposes his experience shows that a simple tower with proper means of preventing the so-called channeling is the easiest solution of the cleaning problem.

A. E. Maccoun, Braddock, Pa., in the discussion, described the experiences in washing gas at the Edgar Thomson steel works, including some preliminary observation with the Murray cleaner, the general features of which were illustrated in *The Iron Age* of September 11, 1913, covering the installation in the Waterside station of the New York Edison Company, of which Thomas E. Murray is general manager and vice-president. The Murray washer, he said, is now being arranged to serve one hot stove. He described it as having a low water consumption and reducing the temperature of the gases but little. One test showed that entering gas having 15.3 gr. of moisture per cubic foot and 0.92 gr. dust left the cleaner with 4.4 gr. moisture and 0.22 gr. dust. He paid a tribute to the Diehl spray type tower. It was not restricted like a baffle washer, which has been abandoned at the Edgar Thomson plant, partly because the baffles quickly became loaded with dust. As an argument for cleaning gas, he mentioned how impracticable it is to burn dirty gas owing to the accumulation of sinter and the high temperatures and that 6-in. checker openings and even 5-in. openings can be provided with clean gas against 9-in. openings now common, with an increase of 30 to 40 per cent. in the amount of the checker heating surface. The efficiency of stoves using clean gas is not only high at the beginning of the run but constant.

Papers were also read by Heinrich J. Freyn, third vice-president H. Koppers Company, Chicago, on the utilization of blast furnace and coke-oven gas for power purposes, reviewed at length elsewhere in this issue, by Robert M. Keeney, Bureau of Mines, Pittsburgh, entitled "Pig Steel from Ore in the Electric Furnace"; by C. B. Murray, Crowell & Murray, Cleveland, on "The Need of Uniform Methods of Sampling Lake Superior Iron Ore," and by Sir Robert Hadfield on "Sound Ingots." Mr. Keeney reported that in the electric furnace production of pig steel, carbon in the product can be kept below 2.2 per cent. and that it is not difficult to slag the greater part of the silicon, phosphorus and sulphur. Mr. Hadfield among other things wrote of treating nine 15-in. ingots, weighing 3600 lb. each, by the Hadfield method, and after the ingots had cooled the hollows or cavities in the sand heads were filled with water and the water measured. The average showed that 139 lb. or 3.88 per cent. of the ingot passed from the head portion into the ingot itself.

There was a total attendance of nearly 400 and at least two public tributes were paid to retiring President Rand for the notable progress which was evident.

CAMBRIA STEEL COMPANY

Report for Year Ended December 31, 1913, the
Best Ever Made by the Company

The enlargements, improvements and diversification of products by the Cambria Steel Company in the past few years are now bearing good fruit. Its volume of business in 1913 was much in excess of that of any previous year, while the net earnings were correspondingly large. The total income in 1913 was \$3,341,260.23, or over 40 per cent., more than in 1912. The income account for 1913, compared with 1912, is as follows:

	1913	Increase
Operating income	\$7,579,813.46	\$3,278,432.66
Rents, investments, etc.....	208,156.11	62,827.57
Total income	\$7,787,969.57	3,341,260.23
Extraordinary replacements and exhaustion of minerals.....	1,099,439.73	554,082.00
Net	\$6,688,529.84	2,787,178.84
Fixed charges	453,579.90	*46,688.00
Net income	\$6,234,949.94	2,823,866.93
Dividends	2,700,000.00	450,000.00
Net surplus	\$3,534,949.94	2,373,866.94

*Decrease.

The surplus December 31, 1912, was \$19,635,225.90. The report states that it has been deemed advisable to set aside out of the surplus the amount of \$2,650,000 to cover the following adjustments: 1. To reduce the book value of the Manufacturers' Water Company, \$850,000. 2. For the rebuilding fund of by-product coke ovens, not previously provided for, \$690,000. 3. Blast furnace relining account, \$110,000. 4. Replacements in steel plants, rolling mills, etc., \$1,000,000. Deducting this amount, the surplus December 31, 1913, stood at \$20,520,175.84.

In the year 1913 expenditures for plant additions totaled \$654,510.59, the principal items being the rebuilding of No. 4 blast furnace and 100 by-product coke ovens, with work started on rebuilding 54 ovens.

The production of pig iron in 1913 was 1,006,172 gross tons, against 972,758 tons in 1912; steel ingots, 1,495,546 tons in 1913, against 1,382,650 tons in 1912. Shipments of finished product were 1,062,737 tons in 1913, against 1,038,634 tons in 1912.

In his accompanying remarks to the stockholders, President William H. Donner says:

"The demand for steel products was such that the company's production and shipments exceeded any previous year, but there was quite a slowing down in business the last quarter and low prices prevailed. Specifications in November and December were so curtailed as to restrict tonnage, despite which fact the inventory of products was increased. The output of pig iron was a record, notwithstanding that the blast furnaces have had a long campaign and all, with one exception, will shortly require relining. Certain improvements, replacements and alterations would have been made in the first nine months of the year had it not been for the serious shortage of labor, which required that the operation of the plants should be given preference, otherwise output and profits would have been further curtailed.

"During the last three months, all of the company's men were employed, the excess not required in current operations being assigned to general repair and construction work, so that practically the entire force of approximately 16,000 men was continuously employed, and at the highest rate of wages in the history of the company, the pay roll being largely in excess of any previous year. Many

changes in mills and methods of operation were made during the year, which, while comparatively insignificant as to cost, were important in the results obtained.

"In the terrible storm on Lake Huron in November the steamship Charles S. Price, owned by the Mahoning Steamship Company (in which this company owns a half interest), was lost, together with its entire crew, consisting of 28 men. It was a most unfortunate and deplorable catastrophe. Another ship is being built to replace this steamer and is under contract for completion in May, 1914."

A New Continuous Chart Recording Instrument

For use as an electrical pyrometer for recording temperature and also as a recording voltmeter or ammeter, a new type of continuous recording instrument has been placed on the market by the Brown Instrument Company, Philadelphia, Pa. It is pointed out that as the d'Arsonval type of direct-current instrument used is of the frictionless type to prevent lag in the readings, a particularly sensitive and accurate instrument is secured.

The instrument case projects only 7 in. from the switchboard or wall and measures 15 in. in height and 8 in. in width. The clock mechanism is placed behind the record chart instead of to one side, thus reducing the space occupied by the instrument. The only part showing on the face of the instrument is the record chart.

A roll of record paper, sufficient to last for two months, is used with the instrument. This can be supplied with an ink ribbon to make a dotted ink record, or the record can be made on coated paper, which does away with the use of ink or ribbon entirely. It is emphasized that it is only necessary to wind the clock mechanism once a week and change the roll of paper once every two months. Two scales are used with the instrument. One of these is placed above the record so that the indications are clearly visible at all times and the paper has another scale printed upon it for direct reading.

Nitrogen in Iron

In a recent issue of *Stahl und Eisen*, Dr. W. Herwig deals elaborately with the question of nitrogen in iron. He finds that the blisters formed on steel plates during rolling and annealing contain a gas which is principally nitrogen. Experiments on steel turnings showed that the nitrogen therein could be reduced from 0.022 to 0.006 per cent. by heating in a current of hydrogen. It was found that this procedure did not increase the nitrogen content, if a current of nitrogen was used; but with a mixture of hydrogen and nitrogen in equal proportions the nitrogen in the steel could be increased to as high as 0.052 per cent. Dr. Herwig is of the opinion that an action similar to this takes place in the converter. An examination of the gases evolved during the solidification of the iron as it comes from a blast furnace revealed the presence of considerable hydrogen and carbon monoxide. White iron was found to contain more hydrogen and hot blast iron more carbon monoxide.

The Asbestos Protected Metal Company, Beaver Falls, Pa., is marketing a new form of prepared roofing which is named Aegisroll. The body of this roofing is wool felt, impregnated by waterproofings and completely enveloped in a coating of asphalt compound. To its upper surface is attached pure asbestos felt, while the lower surface is protected by a coating of crushed quartz. The asbestos and the crushed quartz are both imbedded into their respective surfaces, while the asphalt is hot, and they are therefore permanently attached. This roofing can be furnished in a variety of attractive colors, thus making possible artistic combinations between roofs and the color treatment of the building.

BOOK REVIEWS

Work, Wages and Profits. By H. L. Gantt. Pages 312, 5½ x 7½ in. Second edition, revised and enlarged. Published by the Engineering Magazine Company, New York. Price, \$2.

The first edition appeared in 1910 and was reviewed in *The Iron Age* of July 21 in that year. This last edition is so much enlarged that it almost constitutes a new book. Instead of nine chapters, 194 pages and seven illustrations in the former edition, this one contains 12 chapters, 312 pages and 27 illustrations. The two-color charts, showing the results of the task and bonus system over periods of months in many establishments are now 12 instead of six in the older edition. The greater part of the first edition was made up of a series of articles by Mr. Gantt published in the Engineering Magazine. The new material comprises chapters extending the discussion of "The Task Idea" and "Fixing Habits of Industry," with a new chapter on "Results" and an extended one, "A Practical Example," on scientific management. The author's former close association with Frederick W. Taylor and his own extended studies and experiences are well known, and his book is a representative discussion of the principles of modern industrial organization.

Quin's Metal Handbook and Statistics, 1914. Compiled by L. H. Quin, 3 East India avenue, London, England. Pages 156, 4 x 6¼ in.; cloth. Price, 3s 6d.

The editor, L. H. Quin, is a member of the London Metal Exchange and has compiled the Metal Market Year Book for the past seven years. This is the first issue of the Metal Handbook. It contains metal market prices, in monthly averages, for 1913 and preceding years, and the closing prices by days on the New York and London metal exchanges. Twenty pages are given to iron and steel tables of prices and production, these covering Great Britain in particular, so far as prices are concerned, and all the leading countries for production.

Welding. By Richard N. Hart. Pages 210 + xiv, 6 x 9 in. Published by the McGraw-Hill Book Company, New York. Price, \$2.50.

This book is a treatise on the theory and practice of welding and soldering. On account of its relative importance, the greater part of the work is devoted to the welding of iron and steel. Welding with a forge fire, and the different methods of welding by the use of electric heating, by the newer types of hot flame apparatus and by thermit are treated at length. The book goes into detail in many important matters and gives ideas of the possibilities of development in the art of welding.

Some of the author's explanations are confusing, as for instance the use of the term malleable iron for wrought iron. Most of us think of malleable iron as decarbonized iron castings. On page 10 and elsewhere the author confuses the analyses and properties of cast and wrought iron. Important information necessary to a proper understanding of the text is sometimes omitted. For instance, the author states the prices and also the heating value of gases, but neglects to mention the quantities to which the figures apply.

Some of the author's information is imperfect or even erroneous. He states that alternating current flows mostly on the surface of the conductor, which is not true for common frequen-

cies. His description of the Linde process of producing oxygen on page 107 is imperfect. On page 116 he states that a rise of 8 deg. C in temperature triples the pressure of confined acetylene. Again on page 123 he states that wrought iron is transformed into cast iron when melted by the oxy-acetylene flame, and on page 149 Woehler is stated to be the discoverer of aluminum.

The book, which is practically the only American publication on the subject, will be an excellent addition to the library of every one having to do with the working of metals. Its usefulness is not materially marred by the shortcomings to which reference has been made, but it is unfortunate that the author was not assisted by an editor in its preparation.

Index to Proceedings of the American Society of Testing Materials.—A 158-page book, of 6 x 9 in. pages, is required to index the volumes of part of the proceedings of the American Society for Testing Materials, for the twelve volumes which have been issued to and including 1912. The indexing appears to be done in quite some detail, and by subject as well as by author, and to facilitate finding subjects, there is an index to the index, so to speak, to facilitate finding on what page of the index one may find the references to the subjects treated in the volume. An index bound in the one volume will, of course, prove valuable to owners of the proceedings, of which it is really a companion book of attractive typography. The book may be obtained in a cloth binding at \$1.50 and in half morocco at \$2, from Prof. Edgar Marburg, secretary of the society, University of Pennsylvania, Philadelphia, Pa.

A 190-page pamphlet has also been issued, this covering the membership list and the charter and by-laws, and a list of technical committees, and also a list of the standard specifications. There are now no less than 63 standard specifications developed by the society, and also what may be called standard methods of testing adopted by the society. The total membership listed numbers 1610.

Proceedings of Brooklyn Engineers' Club.—The Proceedings for 1912 of the Brooklyn Engineers' Club, for sale for \$2 to non-members of the society, is a book of some 230 pages, of the 6 x 9 in. size. Among the papers included are the following: "The Relation of the Business Man and Engineer to the Present Industrial Problem," by Frederick L. Cranford, a contractor of Brooklyn, N. Y.; "Railway Appraisal," by Charles A. Whitney; and "City Planning," by Richard Schermerhorn, Jr., landscape architect and engineer, New York City.

The Clinchfield Fuel Company, Spartanburg, S. C., states that its shipment of Clinchfield coal to Galveston, Texas, was for bunkering steamers. The coal having proved satisfactory for the purpose, it will be stored there, but, contrary to reports, this has no significance of the intentions of the company regarding a project to build by-product coking ovens and blast furnaces at Galveston. Ore shipments from Texas to Philadelphia via Galveston have drawn attention to the better utilization of the ore by blast furnaces located at the latter point. The scheme is stated to have had the indorsement of prominent engineers and to have engaged the attention of large financiers, but so far is merely a probability.

The Lufkin Rule Company, Saginaw, Mich., is making all of its tapes with a steel case liner and a push-button opener for the winding handle for those tapes that have a leather case, while the tapes contained in a nickel-plated steel case have the push-button opener and the edge or case band is knurled to give a firm hand hold. It is stated that by using a steel case liner for the leather cases it is possible to decrease the width of the case by ¼ in., thus making it more compact.

THE STEEL CORPORATION SUIT

Reappearance of Several Witnesses Previously Examined—Topping and Donner Recalled

At the hearing in New York City on Tuesday, February 17, in the suit for the dissolution of the United States Steel Corporation, Professor J. W. Jenks was recalled for further cross-examination. The questions of the Government counsel related to various statements given in books and reports written by the professor in the course of the past ten years. These questions related to the consideration of studies of prices as affected by large corporations and to the causes leading up to industrial combinations. He was asked whether there was any method other than by the use of index figures by which prices during months within various years of contrasted periods could be compared so as to show the control of prices exerted by a combination. The reply was that any diagram taken by itself can show prices or control by a combination but that the comparison would be within limits. He said the only accurate and scientific method was by the use of index figures. Professor Jenks was also examined as to his general knowledge of the history of the steel business and of the details of steel manufacture.

William G. Gray, chief statistician of the American Iron and Steel Institute, was called for the purpose of submitting statistics which were to be used in correcting exhibits entered into the record during the examination of President J. A. Farrell last fall.

TOPPING ASKED TO DISCLOSE HIS MINIMUM PRICES

On Wednesday John A. Topping, chairman of the Republic Iron & Steel Company, was called for the purpose of testifying regarding the question as to whether the United States Steel Corporation had the power to put its competitors out of business. He gave two reasons for his belief that it had not the ability to do so. He said, first, that the corporation does not have the physical ability to destroy competitors, and, second, that if it attempted to do so it would involve its own market to such an extent that it would suffer equally with the rest of the trade. He did not believe that the Steel Corporation could localize destructive warfare, stating that a sympathetic relationship exists between all markets, which is so close that, for example, the price could not be affected in Chicago without also being affected in New York. "As a matter of fact," said he, "that is the experience that we have had."

On cross-examination Mr. Topping was asked about the Republic Company's experience in the rail business. He answered:

I came into the Republic Company in 1906, and we had, according to my recollection, 50,000 or 60,000 tons of rails on our books which I did not care to manufacture because I saw possibilities of making money on something else; so I replaced those contracts. In other words, I bought the rails from other producers and satisfied my contracts, and changed the rail mill into a sheet and tin bar mill. That was in the early part of 1907 or in the latter part of 1906.

Mr. Topping was then asked about prices quoted. He said the Republic Company sent out to its various sales managers minimum prices, trusting to their intelligence to get as much above the quotations as they possibly could. Judge Dickinson requested him to produce these price lists for a period of years. Mr. Topping said he did not think all the records were intact, and furthermore he did not feel like giving up the data without first consulting his lawyer. He added:

We usually make a practice of destroying old records after three or four years, when they become obsolete, but I think such a list could be compiled, if it is obligatory on us to do it, but I did not know that the Republic Iron & Steel Company was under examination and that we would be called upon to expose our private affairs in that manner. I will take advice of counsel, and if I am compelled to do it I will do it, otherwise I will not.

Mr. Topping further stated that some of his company's records were destroyed last spring by the flood.

PRESIDENT DONNER AGAIN TESTIFIES

William H. Donner, president Cambria Steel Company, was recalled by the defense. In October, 1912, he first testified and at that time said:

I do not think that there is any one of those companies [referring to Jones & Laughlin, Cambria, Lackawanna, Republic and other companies] that could not compete with the United States Steel Corporation and compete successfully.

Asked to give his reasons for this opinion, Mr. Donner explained that furnaces and steel plants or finishing mills, fully the equal of the corporation's, can be built and labor can be employed at exactly the same price and there is no difficulty in producing the various products at practically the same cost. By endeavoring to put its competitors out of business, said Mr. Donner, the Steel Corporation, itself, would have to commit suicide. He said, with the exception of a small export business, the corporation and its competitors sell to practically the same customers and for this reason all engaged in a warfare would be about on an equal footing. He further said it would be impossible for the corporation to wage warfare against one competitor without involving them all.

Mr. Donner said he does not fear the corporation as much as he does foreign competition. Foreign makers, he said, can build their plants lower than the Steel Corporation or lower than we can. They employ cheaper labor and they have lower rates of freight from many points than either the Steel Corporation or ourselves; that is, from seaboard. For example, the rate of import freight from New Orleans to Cincinnati is 12½c. per 100 lb., while from Pittsburgh to Cincinnati it is 15c. There is no duty on billets or nails and some other steel products. The regular rate of freight from Galveston to Cincinnati is 16½c.

On Friday announcement was made by the attorneys for the Steel Corporation that their side of the case as to presenting evidence is closed, reserving the right to call later the New York Sun reporter who wrote a story on the Trust Company of America in October, 1907. Counsel Kellogg, for the Great Northern Ore trustees, who are also defendants, announced that he would call no witnesses but would submit documentary evidence.

One more series of hearings will be held, which will be that of the Government in rebuttal. This will begin in two or three weeks and will probably come to an end about April 1.

The Knox Pressed & Welded Steel Company, Pittsburgh, has appointed Wonham, Sanger & Bates, Inc., 30 Church street, New York City, its sole Eastern and foreign representative for the sale of general plate work, including tanks of all descriptions, stacks, galvanizing pots, penstocks, standpipes, bins, complete refineries and welded devices of all descriptions.

The Pittsburgh Steel Company, Pittsburgh, is about to install an iron-ore sintering plant at its blast furnaces at Monessen, Pa. There will be two Greenawalt furnaces, each having a capacity of 40 tons of fine ore a day.

ESTABLISHED 1855

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Exports of Iron and Steel in 1913

Statistics of the 1913 exports of iron and steel have now been published by the three leading countries. Germany heads the list, with exports of 6,497,000 metric tons (2204 lb.) in 1913, against 6,042,000 tons in 1912. Great Britain comes second, with 5,050,919 gross tons (2240 lb.), against 4,933,112 tons in 1912. The United States exported 2,760,133 gross tons, against 2,947,597 tons in 1912, taking merely the commodities for which the weight is given. The comparison of the exports of these three countries makes rather an unfavorable showing for the United States. Attention has previously been called to the fact that the figures for this country are undoubtedly very much smaller than they would be if it were possible to include the various articles which are undoubtedly covered by the German and British statistics. We have no means of knowing the tonnage of our large exports of all kinds of machinery, including locomotives, stationary engines, machine tools, metal-working machinery generally, agricultural implements and other merchandise consisting wholly or largely of iron and steel. European countries have long followed the practice of keeping statistics of the weight of a very large part of their exports, while in this country only a limited number of articles are thus classified. This would seem to result from our adoption of methods of classification based on the tariff. Those articles which have long been charged with a specific rate of duty in the tariff have their weights or other measurements carefully recorded, whether they are imports or exports, possibly for the purpose of enabling easy arrangement in tables in connection with import valuations.

It would perhaps be asking too much of the Treasury Department to have its regulations changed regarding statistics of exports of iron and steel simply for the purpose of enabling a better comparison of totals to be made with the totals of exports of leading competitors. It is, nevertheless, unfortunate that we are placed in this position, as it would thus appear that we figure in a comparatively insignificant manner in the world's markets. It would seem from the tonnage figures above given that our exports had actually fallen off as compared with 1912. On the contrary, taking the value of our exports, a gain is shown. The values of exports of iron and steel and manufactures thereof, not including ore, was \$294,435,060 in 1913, against \$289,128,420 in 1912. Unques-

tionably, if it were possible to get the weight of all iron and steel manufactures exported a gain would be seen on 1912, and our figures would make a much better showing as against those above given for Germany and Great Britain.

The Pig-Iron Output in 1913

The statistics of pig-iron production in the United States in 1913, as gathered by the Bureau of Statistics of the American Iron and Steel Institute, were published in *The Iron Age* last week, and confirmed our statement made January 9, that the production in 1913 (estimating charcoal iron) could be put at 31,000,000 tons. The official figure is 30,966,301 tons. Similar close agreement has been shown each year.

An interesting improvement is made in the official statistics, in that for the first time the production of merchant iron is reported separately from the pig iron made for consumption of the makers. The latter production is almost exclusively steel-making material—Bessemer and basic iron and spiegeleisen and ferromanganese made by steel works. Scarcely any foundry iron is made for consumption of the makers. The division is as follows for 1913:

	Gross tons.	Per cent.
For sale	9,734,238	31.4
For consumption	21,232,063	68.6
Total	30,966,301	100.0

A year ago the improvement was introduced of reporting separately the form in which the iron was delivered, whether molten, cast in chill casting machines, cast in loose chills, sand cast or made directly into castings. The figures for the two years follow:

	1912.	1913.
Molten	16,466,722	16,738,952
Machine cast	6,214,121	6,522,075
Chill cast	726,017	1,000,172
Sand cast	6,309,495	6,689,680
Direct castings	10,582	15,422
Total	29,726,937	30,966,301

Each of the first four items above increased, roughly speaking, by about the same amount, some 300,000 tons, so that the proportionate increase was greatest in the loose chill cast and least in the iron delivered molten. The total of molten, machine cast and loose chill cast in 1913 was 24,261,199 tons,

while the production by the consumer class, comprising steel works, was 21,232,063 tons. The difference of 3,029,136 tons represents in a rough way the merchant production of basic pig iron for sale to steel works, plus foundry iron cast in chills; but this only roughly accounts for it, since a little Bessemer iron was probably sand cast at Bessemer steel plants.

The 1913 production of Bessemer pig iron was 11,276,567 tons and of basic 12,537,746 tons, the two combined making 23,814,313 tons. Bessemer showed a decrease of nine-tenths of one per cent. from 1912, while basic showed an increase of 9.8 per cent. This establishes the fact that Bessemer steel production was approximately the same in 1913 as in 1912, but the statistics of steel-ingot production must be awaited to determine whether the increase in basic open-hearth steel production was greater or less than 10 per cent., there being the important unknown element of the proportions of scrap and pig iron used in its manufacture.

The proportion of molten iron used to total production of Bessemer and basic iron was 70.5 per cent., against a similar showing of 72.2 per cent. for 1912. Inasmuch as the steel works which regularly use direct metal must at various times cast their blast furnace product, it is safe to assume that at steel works comprising more than 80 per cent. of the total capacity the direct metal process is regularly employed. As the producer-consumer class reported a production of 21,232,063 tons, and the total of molten iron was 16,738,952 tons, a rough idea may be secured of the amount of "Sunday" and other cast metal at steel works.

So much has been said lately to the effect that our pig-iron production is growing much more slowly than formerly that some specific computations are in place. The active period 1905-6-7 is generally taken as representing the end of the old order of things, of rapidly increasing production. There was a sharp curtailment in the last two months of 1907; hence 1906, a year in which production was maintained throughout at the heaviest possible rate, makes an excellent one to select for comparative purposes. The increase from 1906 to 1913, seven years, was 22.37 per cent., or at an average rate of increase, one year over the preceding, of 2.93 per cent. a year. The average annual rate of increase from 1886 to 1906 has been 7.85 per cent. and from 1866 to 1886, 8.06 per cent. Thus there has apparently been a great drop in the rate of increase in the past seven years.

It is dangerous, however, to make generalizations in the iron trade. Seeing that it is frequently held that in pig-iron production periods of slow growth have alternated with periods of rapid growth, another comparison may be made, and this comparison shows that in the seven years from 1866 to 1873 production increased 112.4 per cent.; in the seven years following 1886 it increased 25.7 per cent., while in the seven years following 1906 it increased 22.4 per cent. Possibly, then, the falling down was not so complete as is generally assumed.

Of course the comparison of 20 years ago is between 1886, a record year, and 1893, a panic year, whereas 1913, instead of being a panic year as so many expected, was really a good year. The common view would doubtless be that since 1913 was

a good year it will be impossible for subsequent years to improve upon it as much as subsequent years improved upon 1893. The surprising thing is that although there was a general industrial depression from 1893 through 1897 or 1898, considerable gains were made in production, 1895, 1897 and 1898 each in its turn establishing a new record. Under relatively good industrial conditions, pig-iron production may now grow for a while at as great a rate as it did 20 years ago under distinctly adverse conditions.

Revenue from "Spotting" Cars

Since the discussion which appeared in these columns a fortnight ago on the decision of the Interstate Commerce Commission regarding industrial railroads, it has become evident that the railroad lines are hastening an effort to develop all they can out of the commission's intimation that a charge for spotting cars might be sanctioned. It will be recalled that in denying the right of the line carriers to make allowances to industrial railroads for spotting their own cars, the commission insisted that the free spotting now done for ordinary shippers must be regarded as a voluntary service and not one for which a part of the through rate can be viewed as compensation, and in several places the decision clearly intimated that an extra charge for spotting, in addition to the regulate rate, would be considered admissible. The railroads, it is now clearly shown, have been quick to take up the suggestion, and despite an occasional formal denial it is accepted by many shippers that an effort will shortly be made to enforce a general system of charges for spotting cars.

The commission's language is in such form as to suggest that spotting is by no means always required, but it would seem a fair guess that unless the charge were made quite high the majority of shippers would pay the charge on account of the great inconvenience of spotting cars themselves.

It becomes of interest in the circumstances to make an estimate of the amount which would be involved in spotting charges. There are no statistics of the number of carloads of freight moved, but there are statistics of car-mileage and of the average length of haul of all freight. Inasmuch as the Eastern roads have a case before the commission for general rate advances, the statistics relating to these roads are of particular interest. The latest report of the commission shows that the loaded car mileage of the Eastern roads in a fiscal year was 5,906,670,098 miles, and this divided by the average distance which the freight was hauled, 130.43 miles, gives some 45,000,000 carloads, provided no less than carload business had been included. The great bulk of the movement, of course, is carload. Against a large part of the movement, apparently, there is a chance of the railroads being able to enforce spotting charges, or leave the spotting to be done by the shipper. Rates spoken of are \$1, \$2 or \$3 a car, or else ton rates which would make considerably larger sums per car. It is easy to imagine, therefore, that the spotting charge which now bids fair to become an important issue could easily mount up to more than the \$50,000,000 commonly assigned as the amount involved in the pending rate case. It is to be observed, furthermore,

that if a spotting charge for the loaded car can be enforced, a spotting charge might also be established in the case of empties. Rather than pay the charge, the industrial railroads and some other large shippers would do their own spotting, and in time other shippers would develop means to do their spotting themselves. But at the outset the revenue to the railroads would be large, and as they claim the suggested charges would only represent actual cost, they would be equally benefited by the shipper doing his spotting, through reduction in operating expenses.

The figures mentioned above refer only to the Eastern roads, but of course if a spotting charge is permitted it will be applicable to the Southern and Western roads as well. The Southern roads report a loaded car mileage of 2,084,128,616 miles, with an average haul of 187.80 miles, while the Western roads report 4,675,337,392 loaded car miles, with a typical haul of 153.81 miles. For all districts the number of carloads would be about 82,000,000, provided all the freight was carload business. An important source of possible revenue is thus opened up to the railroads.

The decision in the industrial railroad case was rendered five weeks ago. There is reason to believe that the interests involved have been assiduously endeavoring to find ground for claiming a continuance of some, at least, of the allowances interdicted by the decision, but apparently the search has been unavailing. It is well to mention that the real aspect of the decision is not that the commission has lately discovered or has but lately turned its attention to this subject of industrial railroads. On the contrary the wait has not been so much for facts as for legislation. In *The Iron Age* of April 6, 1905, there appeared a brief résumé of the subject of allowances to industrial railroads, from which it appears that the commission had already done much investigating, having made a general order to investigate these tap lines immediately following the Elkins-Mann act of February 3, 1903. That act gave the commission additional authority, but apparently not enough to enable it to act as vigorously as it has now done since the supplementary legislation of less than three years ago.

New forms for reporting accidents are being mailed to the heads of industrial plants throughout Pennsylvania by the Department of Labor and Industry acting in conjunction with the bureau of statistics of the Department of Internal Affairs. The accident reports contain many new features. A report within 24 hours is required on serious and fatal accidents and under the act of 1913 reports are required on accidents resulting in disability for two days or more. No such report can be used as evidence against the employer in any proceeding. The reports require very detailed information on the extent of injuries, far more than ever asked in Pennsylvania, including questions on safety organization of plant and character of machinery, with a question as to whether caused by defective equipment, lack of safeguards or careless methods, the blank stating "carelessness not accepted as satisfactory description."

The following five French tube companies have formed an association for the maintenance of prices: Laminoirs à Tubes, Haumont; Tôleries de Louvroil; Escaut & Meuse, Anzin; Fabriques de Tubes de Solismes, and Tubes de Valenciennes.

Accuracy in Blast Furnace Statistics

The Iron Age has published monthly blast-furnace statistics for a good many years. Previous to 1902 these took the form of monthly statements of the weekly capacity of furnaces in blast at the beginning of a month. For the past 12 years the statistics of coke and anthracite pig-iron production have been printed each month, together with the capacity of furnaces in blast at the beginning of the new month.

Originally the mails were depended on for practically all the figures. Few companies had more than one or two furnaces, and many returns were belated. Rarely could the figures be published before the 10th of the month, and at times they were later. The consolidations, as they came on, simplified matters somewhat and the demand for early figures grew until it was not uncommon to print them on the fourth and fifth day of a month, and by using the wires freely it has been possible once or twice to give the statistics on the second day of the month. Naturally, with so much telegraphing, and with the estimates of the production of some furnaces which are inseparable from such speedy work, the chance of error has increased. But even so, this factor has been remarkably small—averaging, in fact, only one-thirtieth part of the 5 per cent. which the eminent statistician, General Francis A. Walker, considered allowable in usable statistics—and our readers have had the benefit of the prompt information on the trend of production.

A question has been raised by a Cleveland iron and steel paper as to the relative accuracy of its blast-furnace figures and those of *The Iron Age*. We are quite willing our readers should have the data with which to make a comparison. Below are our totals of coke and anthracite iron by years, placed alongside those of the American Iron and Steel Association, for the seven years in which the Iron Trade Review has been collecting similar statistics:

	American I. & S. Assn.	<i>Iron Age</i>	Deviation tons	Deviation per cent.
1907	25,343,964	25,312,703	31,261	0.123
1908	15,686,872	15,641,537	45,335	0.291
1909	25,419,468	25,410,463	9,005	0.035
1910	26,907,060	26,855,511	51,549	0.191
1911	23,370,871	23,311,711	59,160	0.253
1912	29,379,912*	29,383,490	3,578	0.012
1913	30,626,320*	30,724,581	98,261	0.32
Average deviation for the seven years, 42,593 tons.				
Average per cent. deviation, 0.168.				

*American Iron and Steel Institute.

The coke and anthracite production, as shown by our Cleveland contemporary's figures for the same years is given below with its deviations from the American Iron and Steel Association's figures:

	American I. & S. Assn.	Cleveland figures	Deviation tons	Deviation per cent.
1907	25,343,964	25,119,157	224,807	0.89
1908	15,686,872	15,854,573	167,701	1.07
1909	25,419,468	25,337,002	82,466	0.325
1910	26,907,060	26,845,314	61,746	0.229
1911	23,370,871	23,198,601	172,270	0.737
1912	29,379,912*	29,325,513	54,399	0.185
1913	30,626,320*	30,652,767	26,447	0.086
Average deviation for the seven years, 112,691 tons.				
Average per cent. deviation, 0.447.				

*American Iron and Steel Institute.

We have had some difficulty in making this last compilation, due to the fact that for many of the months two sets of figures were given—one published soon after the close of the month, with a second attempt a month later. For instance, in early March, 1908, the figure given by the Cleveland paper for February output was 1,233,074 tons. In early April, when it made a comparison between the February and March figures, the former had shrunk to 1,086,809, a trifling difference of 146,265 tons, or 13.5 per cent.

Taking the entire showing for the seven years. *The Iron Age* has had an average deviation from the official figures, which require four to six weeks for their collection each year, of one-sixth of one per cent. The average deviation of the Cleveland figures has

been nearly one-half of one per cent., or about three times as much. By tons, the average deviations have been 42,593 and 112,691 respectively.

In this connection we shall not overlook a suppression of fact concerning *The Iron Age's* blast furnace figures of January 1. It was distinctly pointed out in footnotes to our table of furnaces in blast on that date that of the 212 so counted 18 were "banked"—12 in the Pittsburgh district, 3 in the Chicago district and 3 in northern Ohio. In addition, 3 in the Mahoning Valley were banked, that were not included in the footnote references. The Cleveland paper, in commenting on these statistics, misrepresents them by omitting the material fact stated above. The 18 furnaces shown in our table as "banked" were not blown out, as stated in the "million-idle-men" sensation published at Cleveland; in fact, half of them had actually resumed before that article was printed. But the misrepresentation of *The Iron Age's* figures is perhaps not surprising in view of the ability of the weekly and daily editions of the Cleveland paper to make directly opposite statements concerning iron market conditions on the same day. On January 15 the Daily Iron Trade wired to Representative Humphrey this statement, which was used by him on the floor of the House at Washington in a denial of iron trade improvement and an attack on confidence:

"Steel condition continues to grow worse. Connelville, Pa., district coke workers' wages are being reduced 10 per cent. and 2100 coke ovens closed down this week for indefinite period."

The weekly edition of the same paper, whose market reports are gathered by the same staff, had on the same day, January 15, these statements prominently displayed:

"Improvement in the iron trade is extending. . . . That the recent improvement in the iron trade is not merely sentimental, but rests upon a solid foundation, is being shown from day to day as new business expands and prices become less irregular. . . . Optimism, which has been a dominant characteristic of the Western iron and steel markets for the past three weeks, now has a more substantial reason for its existence. Broadly speaking, more tonnage was booked between January 6 and January 13 than during any other week in the past four months. . . . Subsidiary companies of the Steel Corporation have increased outputs this week."

It is scarcely appropriate to discuss "accuracy" in connection with the above extracts. They tell their own story of the level that can be reached when iron market information becomes the pawn of politics.

Bullock Electric Company's Affairs

The preferred stockholders' committee of the Bullock Electric Mfg. Company, Cincinnati, has agreed upon the following plan: "The preferred stockholders are to receive in exchange for their stock bonds of the Bullock Electric Mfg. Company at the rate of \$80 in bonds for each \$100 of preferred stock. These bonds are to be dated January 1, 1914, bear 6 per cent. interest, payable semi-annually, and be secured by first mortgage on the plant and property of the Bullock Electric Mfg. Company. The bond issue is limited to \$936,000, the amount necessary to take up on the basis above stated the entire outstanding preferred stock, namely, \$1,170,000. The date of maturity will be from 20 to 25 years; denomination, \$100 or multiples thereof. In addition to the said bonds, all dividends on the preferred stock up to and including January 1, 1914 (7½ per cent.) are to be paid in cash. After such exchange the Bullock Electric Mfg. Company is to transfer its plant and property to the Allis-Chalmers Mfg. Company (subject to the mortgage), which then expects to operate it as a branch of its business."

The Suffern Engineering Corporation, Singer Building, New York, announces that it has taken over and will continue under the direction of Ernest S. Suffern, its president, the industrial engineering engagements heretofore conducted by Suffern & Son.

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Iron-Ore Analyses for 1914

Oglebay, Norton & Co.'s book of iron-ore analyses for 1914 is bound in red morocco and contains 64 pages of analyses of various ores and interleaved memorandum pages. Twelve ores from the Gogebic range are listed, five from the Menominee range, seven from the Mesaba range and one from the Marquette range. In the Sudbury district of Canada are the Moose Mountain magnetic ore, crushed and screened to a maximum size of one inch, and the Moose Mountain briquettes, made by the Grondal process. The latter are guaranteed for 1914 at 64.68 per cent. iron, as against 63.03 per cent. in 1913.

The Independent Pneumatic Tool Company announces the following appointments of district managers, effective March 1: R. T. Scott, manager of Pittsburgh district, with office at 1208 Farmers Bank Building, Pittsburgh; F. H. Charbono, manager of Southern district, with office at 1629 Candler Building, Atlanta, Ga.

The Terry Steam Turbine Company, New York, has acquired from the Rateau Steam Regenerator Company a license to manufacture mixed pressure turbine regulators under Rateau United States patent.

The Iron and Metal Markets

PIG IRON FROM CANADA

Imports to Be Made via Philadelphia

Further Rail Orders—Industries Consuming Steel Still Lag

Reports from the large steel companies emphasize the good rate of specifications more than that of strictly new orders. Chicago notes an appreciable lull in new business in steel products, as well as pig iron; at Pittsburgh recent conditions are practically unchanged both as to mill operations and new bookings.

The extent to which manufacturing consumers have caught step with the rolling mills is a matter on which steel makers are seeking light, in determining how far the restocking movement of recent weeks will have the backing of expanding industry. The coming month may make this clearer. Foundries have shown practically no increase in their melt of iron and in machinery lines there has been no real movement thus far.

Steel companies have been using up accumulated pig iron and a few more blast furnaces are going in, including two at Sparrows Point and three of the Carnegie Steel Company stacks. Last week the Steel Corporation blew in four furnaces. Its active steel ingot capacity this week is 82 per cent. The average of independent companies is below this. For the month a considerable increase in the Steel Corporation's unfilled orders is indicated.

Late additions to the Illinois Central's rail orders bring the total up to 67,500 tons, divided between the Ensley and Chicago district mills. The Great Northern has placed a total of 15,000 tons with three companies, and the Buffalo, Rochester & Pittsburgh has bought 5000 tons at Pittsburgh, besides placing similar contracts with two other companies. A sale of 7500 tons has been made for shipment to the east coast of South America.

Structural contracts let in the week amount to 40,000 tons, of which about 15,000 tons went to the leading company. At Philadelphia the Widener building will require about 9000 tons and the Great Northern office building at St. Paul 8000 tons.

Developments in most finished lines have been meager. The mills are quite well sold for March, but here and there an order comes up that is eagerly competed for, as is to be expected with existing slack in capacity.

Buying in a small way for shipment to the United States is reported in Belgian and German finished material markets, and German steel bars are being offered at more attractive prices on our Atlantic seaboard, though without sales. There has been some inquiry also on American account for continental semi-finished steel of special analysis. German pig iron stocks increased 38,000 tons in January to 653,000 tons, against 243,000 tons on February 1 last year, not a heavy gain considering the strain on the German iron trade in the year.

The Eastern pig-iron market is interested in recent offerings of foundry iron from the Dominion Iron & Steel Company's furnaces at Sydney, Nova Scotia. Arrangements have been made to bring in cargoes of this iron at Philadelphia for distribution through the East. It has been offered at about \$15

for No. 2 at and near Boston and sales to New England foundries are reported.

To the recent buying of basic pig iron in eastern Pennsylvania several transactions have been added, one steel company closing for 10,000 tons.

Some buyers are sounding the foundry iron market for the second half. Furnaces have so little profit on their sales for the first six months that they are asking 50 cents to \$1 advance on deliveries beyond July 1. Buffalo furnaces generally have their figure at \$14 for No. 2 X for the second half. Even in the face of small buying, furnaces in the Middle West are taking a firmer stand.

A steel foundry company is still in the market for basic iron in the middle West—15,000 to 20,000 tons—and a northern Ohio steel company will buy 10,000 tons for the last half.

That the Tata foundry iron from India will come into this country is entirely probable, but the reports of definite buying are not confirmed.

Cleveland reports that one vessel interest has taken contracts to carry more than 1,000,000 tons of ore this year at the 1913 rate of 55 cents.

Coke for March has sold at \$2, but is weaker for prompt shipment, Cleveland furnaces buying at \$1.75 to \$1.80.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous.

	Feb. 25, 1914.	Feb. 18, 1914.	Jan. 28, 1914.	Feb. 25, 1913.
Pig Iron, Per Gross Ton:				
No. 2 X, Philadelphia...	\$15.00	\$15.00	\$14.75	\$18.00
No. 2, Valley furnace...	13.25	13.25	12.75	17.00
No. 2 Southern, Cin'ti...	14.00	13.75	13.75	16.50
No. 2, Birmingham, Ala.	10.75	10.50	10.50	13.25
No. 2, furnace, Chicago*	14.25	14.00	13.50	17.25
Basic, del'd, eastern Pa.	14.25	14.25	14.00	18.00
Basic, Valley furnace...	13.25	13.25	12.50	16.25
Bessemer, Pittsburgh...	15.15	15.15	14.90	18.15
Malleable Bess., Ch'go*	14.00	14.00	13.50	17.25
Gray forge, Pittsburgh...	13.65	13.65	13.40	17.15
L. S. charcoal, Chicago...	15.25	15.25	15.25	18.00

Billets, etc., Per Gross Ton:				
Bess. billets, Pittsburgh...	21.00	21.00	20.50	28.50
O.-h. billets, Pittsburgh...	21.00	21.00	20.50	29.00
O.-h. sheet bars, P'gh...	22.00	22.00	21.00	29.50
Forging billets, base, P'gh...	25.00	25.00	24.00	36.00
O.-h. billets, Phila...	23.40	23.40	22.40	32.00
Wire rods, Pittsburgh...	26.50	26.50	25.50	30.00

Old Material, Per Gross Ton:				
Iron rails, Chicago...	13.25	13.25	13.00	16.25
Iron rails, Philadelphia...	16.50	16.50	16.00	18.00
Carwheels, Chicago...	12.25	12.50	12.00	16.75
Carwheels, Philadelphia...	12.75	12.75	12.50	15.00
Heavy steel scrap, P'gh...	12.75	12.75	11.50	14.00
Heavy steel scrap, Phila...	11.00	11.00	11.00	12.50
Heavy steel scrap, Ch'go...	10.25	10.50	9.75	12.00
No. 1 cast, Pittsburgh...	12.00	12.00	10.75	15.00
No. 1 cast, Philadelphia...	13.00	13.00	12.00	14.00
No. 1 cast, Ch'go (net ton)	10.75	10.75	10.50	12.50

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Finished Iron and Steel,				
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia...	1.27 1/2	1.27 1/2	1.22 1/2	1.67 1/2
Iron bars, Pittsburgh...	1.40	1.40	1.35	1.70
Iron bars, Chicago...	1.12 1/2	1.12 1/2	1.10	1.57 1/2
Steel bars, Pittsburgh...	1.20	1.20	1.20	1.70
Steel bars, New York...	1.36	1.36	1.36	1.86
Tank plates, Pittsburgh...	1.20	1.20	1.20	1.70
Tank plates, New York...	1.36	1.36	1.36	1.86
Beams, etc., Pittsburgh...	1.20	1.20	1.20	1.70
Beams, etc., New York...	1.36	1.36	1.36	1.86
Skeln, grooved steel, P'gh	1.25	1.25	1.20	1.45
Skeln, sheared steel, P'gh	1.35	1.35	1.30	1.50
Steel hoops, Pittsburgh...	1.30	1.30	1.30	1.60

Sheets, Nails and Wire,				
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh	1.95	1.95	1.95	2.35
Galv. sheets, No. 28, P'gh	2.95	2.95	2.95	3.50
Wire nails, Pittsburgh...	1.60	1.60	1.55	1.75
Cut nails, Pittsburgh...	1.65	1.60	1.60	1.70
Fence wire, base, P'gh...	1.40	1.40	1.35	1.55
Barb wire, galv., P'gh...	2.00	2.00	1.95	2.15

Coke, Connellsville,

	Feb. 25, 1914.	Feb. 18, 1914.	Jan. 28, 1914.	Feb. 26, 1913.
Per Net Ton at Oven:				
Furnace coke, prompt...	\$1.85	\$1.85	\$1.85	\$2.35
Furnace coke, future...	2.00	2.00	2.00	2.50
Foundry coke, prompt...	2.50	2.50	2.50	3.00
Foundry coke, future...	2.75	2.75	2.60	3.00

Metals,

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York...	15.00	15.00	15.00	15.00
Electrolytic copper, N. Y.	14.50	14.62½	14.50	14.75
Spelter, St. Louis.....	5.20	5.25	5.20	6.10
Spelter, New York.....	5.35	5.40	5.35	6.25
Lead, St. Louis.....	3.87½	3.87½	4.02½	4.20
Lead, New York.....	4.00	4.00	4.10	4.35
Tin, New York.....	38.12½	39.25	39.12½	48.50
Antimony, Hallett's, N. Y.	7.00	7.00	7.00	8.62½
Tin plate, 100-lb. box, Pgh.	\$3.30	\$3.30	\$3.25	\$3.60

Finished Iron and Steel f. o. b. Pittsburgh

Freight rates from Pittsburgh, in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Louis, 22½c.; Kansas City, 42½c.; Omaha, 42½c.; St. Paul, 32c.; Denver, 84½c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.20c. to 1.25c. base, net cash, 30 days. Following are stipulations prescribed by manufacturers with extras:

Rectangular plates, tank steel or conforming to manufacturer's standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras	Cents per lb.
Gauges under ¼ in. to and including 3-16 in....	.10
Gauges under 3-16 in. to and including No. 8....	.15
Gauges under No. 8 to and including No. 9....	.25
Gauges under No. 9 to and including No. 10....	.30
Gauges under No. 10 to and including No. 12....	.40
Sketches (including straight taper plates) 3 ft. and over.....	.10
Complete circles 3 ft. in diameter and over.....	.20
Boiler and flange steel.....	.10
"A. B. M. A." and ordinary firebox steel.....	.20
Still bottom steel.....	.30
Marine steel.....	.40
Locomotive firebox steel.....	.50
Widths over 100 in. up to 110 in., inclusive.....	.05
Widths over 110 in. up to 115 in., inclusive.....	.10
Widths over 115 in. up to 120 in., inclusive.....	.15
Widths over 120 in. up to 125 in., inclusive.....	.25
Widths over 125 in. up to 130 in., inclusive.....	.50
Widths over 130 in.....	1.00
Cutting to lengths, under 3 ft., to 2 ft. inclusive.....	.25
Cutting to lengths, under 2 ft., to 1 ft. inclusive.....	.50
Cutting to lengths, under 1 ft.....	1.55
No charge for cutting rectangular plates to lengths 3 ft. and over.	

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zeos, 3 in. and over, 1.20c. to 1.25c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.....	.10
I-beams over 18 in.....	.10
Angles over 6 in. on one or both legs.....	.10
Angles, 3 in. on one or both legs, less than ¼ in. thick as per steel bar card, Sept. 1, 1909.....	.70
Tees, structural sizes (except elevator, hand rail, car truck and conductor rail).....	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909.....	.20 to .80
Dock beams and bulb angles.....	.30
Hand rail tees.....	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive.....	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive.....	.50
Cutting to lengths, under 1 ft.....	1.55
No charge for cutting to lengths 3 ft. and over.	

Wire Rods.—Bessemer, open-hearth and chain rods, \$26.50 to \$27.

Wire Products.—Fence wire, Nos. 0 to 9 per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers annealed, \$1.40; galvanized, \$1.80. Galvanized barb wire and fence staples, to jobbers, \$2; painted, \$1.60. Wire nails to jobbers, \$1.60. Prices of the foregoing wire products to dealers, in carload lots, are 5c. higher. Woven wire fencing, 74 per cent. off list for carloads; 73 off for 1000-rod lots; 72 off for less than 1000-rod lots.

The following table gives the price to retail mer-

chants on fence wire in less than carloads, with the extras added to the base price:

	Plain Wire, per 100 lb.							
Nos.	0 to 9	10	11	12&12½	13	14	15	16
Annealed	\$1.60	\$1.65	\$1.70	\$1.75	\$1.85	\$1.95	\$2.05	\$2.15
Galvanized	2.05	2.05	2.10	2.15	2.25	2.35	2.75	2.85

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe in effect from February 2, 1914, and iron pipe from June 2, 1913, all full weight:

Steel.			Butt Weld			Iron.		
Inches.	Black.	Galv.	Inches.	Black.	Galv.	Inches.	Black.	Galv.
1½, ¾ and ¾	72½	52	1½ and 1½	66	47	1½ and 1½	66	47
1½	76½	66	¾	65	46	¾	65	46
¾ to 3	79½	71	¾ to 2½	69	56	¾ to 2½	69	56

Lap Weld			Reamed and Drifted		
2	76½	68	1½	56	45
2½ to 6	78½	70	1½	67	56
7 to 12	75½	65	2	68	58
13 to 15	52½	..	2½ to 4	70	61
			4½ to 6	70	61
			7 to 12	68	55

Butt Weld, extra strong, plain ends			Lap Weld, extra strong, plain ends		
1½, ¾ and ¾	67½	57	1½	65	59
¾ to 1½	72½	66	2½ to 4	67	58
2 to 3	76½	70	4½ to 6	70	61
			7 to 8	67½	57
			9 to 12	62½	52

Butt Weld, double extra strong, plain ends			Lap Weld, double extra strong, plain ends		
1½, ¾ and ¾	62½	56	1½	63½	57
¾ to 1½	65½	59	2½ to 4	65½	59
2 to 2½	67½	61	4½ to 6	64½	58
			7 to 8	57½	47

Standard Charcoal Iron			Boiler Tubes.—Discounts to jobbers, in carloads, in effect from January 2, 1914, are as follows:		
1½ in.	45		1½ and 2 in.	49	
1½ and 2 in.	49		2½ in.	45	
2½ in.	45		2½ to 2¾ in.	54	
2½ to 2¾ in.	54		3 and 3½ in.	57	
3 and 3½ in.	57		3½ to 4½ in.	60	
3½ to 4½ in.	60		5 and 6 in.	49	
5 and 6 in.	49				

Locomotive and steamship special charcoal grades bring higher prices.			Sheets.—Makers' prices for mill shipment on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net or 2 per cent. cash discount in 10 days from date of invoice:		
2½ in. and smaller, over 18 ft., 10 per cent. net extra.			Blue Annealed Sheets	Cents per lb.	
2¾ in. and larger over 22 ft., 10 per cent. net extra.			Nos. 3 to 8	1.40 to 1.45	
Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft., and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points.			Nos. 9 to 10	1.45 to 1.50	
			Nos. 11 and 12	1.50 to 1.60	
			Nos. 13 and 14	1.55 to 1.65	
			Nos. 15 and 16	1.65 to 1.70	

To the large jobbing trade an additional 5 and 2½ per cent. is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Box Annealed Sheets, Cold Rolled		
Nos. 10 and 11	1.60 to 1.65	
No. 12	1.60 to 1.65	
Nos. 13 and 14	1.65 to 1.70	
Nos. 15 and 16	1.70 to 1.75	
Nos. 17 to 21	1.75 to 1.80	
Nos. 22 and 24	1.80 to 1.85	
Nos. 25 and 26	1.85 to 1.90	
No. 27	1.90 to 1.95	
No. 28	1.95 to 2.00	
No. 29	2.00 to 2.05	
No. 30	2.10 to 2.15	

Galvanized Sheets of Black Sheet Gauge

	Cents per lb.
Nos. 10 and 11.....	1.95 to 2.00
No. 12.....	2.05 to 2.10
Nos. 13 and 14.....	2.05 to 2.10
Nos. 15 and 16.....	2.20 to 2.25
Nos. 17 to 21.....	2.35 to 2.40
Nos. 22 and 24.....	2.50 to 2.55
Nos. 25 and 26.....	2.65 to 2.70
No. 27.....	2.80 to 2.85
No. 28.....	2.95 to 3.00
No. 29.....	3.10 to 3.15
No. 30.....	3.25 to 3.30

Pittsburgh

PITTSBURGH, PA., February 25, 1914.

Inquiry for iron and steel products has quieted down materially. Orders entered by the mills are also showing a falling off as compared with the activity in the latter part of January and early this month. The falling off in new business is stated to be partly due to the heavy snows and cold weather of the past two weeks, and partly to buyers having covered pretty heavily for February and March needs and in some cases through second quarter. The belief prevails that another buying movement will come as soon as warmer weather starts, and there is also every confidence that the volume of business this year will be heavy, although prices may be relatively low. For structural material and bars the demand is fair and specifications are good. Sheets and tin plate are active. Orders for pipe so far this month have been heavier than in the same period in January. Coke is steady, but scrap prices are weaker. The efforts of dealers to hold heavy steel scrap at \$13.50, Pittsburgh, have failed utterly.

Pig Iron.—The market is dull. A steel company in central Ohio is reported to have bought about 10,000 tons of basic from two Cleveland furnace interests at \$13 or \$13.25 at Valley furnace, deliveries running up to July. The report that the American Steel Foundries will buy 20,000 to 40,000 tons of basic for its Alliance and Sharon works is not verified. The company would likely buy if the price were lower, but is said to regard \$13.25 at Valley furnace as too high. Several small lots of basic have been sold the past week at \$13.25, Valley furnace. In the absence of actual sales, we repeat former prices as follows: Bessemer, \$14.25; basic, \$13.25; No. 2 foundry, \$13.25 to \$13.50; gray forge, \$12.75 to \$13; malleable Bessemer, \$13.50 to \$13.75 for delivery through first half of this year, all at Valley furnace, the freight rate to the Pittsburgh or Cleveland district being 90c. a ton.

Billets and Sheet Bars.—Orders sent to the mills for rolling by the billet and rail sales bureau of the Carnegie Steel Company up to February 23 were about 40,000 tons heavier than in the same time in January. Sheet and tin-plate mills are specifying freely against contracts for sheet bars. The American Sheet & Tin Plate Company is using more sheet bars now from the Carnegie Steel Company than in any time for some months. Inquiry is dull, as all consumers of billets and sheet bars are well covered by contracts. Youngstown and Pittsburgh steel mills are quoting \$23 at mill on sheet bars for second quarter but we do not hear of any sales. For shipment in February and March we quote Bessemer and open-hearth billets at \$21 and Bessemer and open-hearth sheet bars at \$22, f.o.b. makers' mills, Pittsburgh or Youngstown, for this and next month. We quote forging billets at \$25 on desirable specifications, embracing only one size, and up to and not including 10 x 10 in. the regular extras being charged for larger sizes. On small orders, forging billets are held at \$26. We quote axle billets at \$23 for desirable orders and \$24 for small orders.

Muck Bar.—A sale of 500 tons of local muck bar is reported at about \$28.50 delivered at buyer's mill. We quote best grades, made from all pig iron, at \$28.50 to \$29, delivered to consumers' mills in the Pittsburgh district. Eastern muck bar, in which part scrap is used, is being offered at \$26.50 to \$27 delivered.

Steel Rails.—No important orders for standard sections were placed in the past week, but a fair amount of business is going in small lots. The new demand for light rails is active, the lumber interests placing more orders than at any time in a year or more,

while the coal miners are also buying freely. Last week the Carnegie Steel Company received new orders and specifications for over 3000 tons of light rails. We quote slice bars at 1.50c. and standard section rails at 1.25c. Light rails, rolled from billets, are quoted as follows: 25, 30, 25, 40 and 45 lb. sections, 1.25c.; 16 and 20 lb., 1.30c.; 12 and 14 lb., 1.35c., and 8 and 10 lb., 1.40c., all in carload lots, f.o.b. Pittsburgh.

Wire Rods.—The new demand is fairly active, with a scarcity in the supply, as nearly all the wire mills are running full and using the greater part of their output. A sale of 300 tons of open-hearth rods is reported at \$26.50, Pittsburgh. We quote Bessemer, open-hearth and chain rods at \$26.50 to \$27, Pittsburgh.

Skelp.—Inquiry is active and prices are firm. A sale is reported of 1000 tons of narrow grooved steel skelp for March and April shipment at 1.25c., maker's mill, Pittsburgh. We quote: Grooved steel skelp, 1.25c. to 1.30c.; sheared steel skelp, 1.35c. to 1.40c.; grooved iron skelp, 1.65c. to 1.70c.; sheared iron skelp, 1.70c. to 1.75c., delivered to consumers' mills in the Pittsburgh district.

Plates.—New demand is dull and all the plate mills are in need of orders. Inquiries for cars are more active, and some small contracts have been placed. The Pressed Steel Car Company has taken 500 steel gondolas for the Virginia Southwestern; the Mt. Vernon Car Company, 500 box cars for the Florida & East Coast, and the American Car & Foundry Company, 250 ore cars for the Northern Pacific and 6000 underframes for the Chicago & Northwestern. The Southern Railway is in the market for 3000 hoppers, gondolas, coke and flat cars, and the New York Central has an inquiry out for 3000 box and hopper cars. This inquiry is giving a good deal of encouragement to the steel car companies, as about two years ago the New York Central put out an inquiry for 3000 cars and before it got through bought about 22,000. The Riter-Conley Mfg. Company has taken 1000 tons of dredge pipe for the St. Lawrence River Power Company, the plates to be rolled by the Carnegie Steel Company. It will probably be about April 15 before the T. A. Gillespie Company, of this city, the low bidder, will know whether it will get the contract for the riveted plate line for water supply to Ottawa, Canada, requiring 40,000 tons of plates. The project is to be voted on at an election to be held in April. Plates ¼ in. and heavier can still be had at 1.20c., but it is said none of the mills is selling at 1.15c. The Carnegie Steel Company is still holding firmly at 1.25c. for delivery in this and next quarter. We quote ¼-in. and heavier plates at 1.20c. on desirable orders for prompt shipment and 1.25c. for delivery in second quarter, f.o.b. Pittsburgh.

Ferroalloys.—The new demand for ferromanganese is quiet. The Carnegie Steel Company is still holding domestic 80 per cent. ferromanganese at \$42, but has not been an active seller for some time. We quote English 80 per cent. ferromanganese at \$39, Baltimore, the same price being asked for German, with a freight rate to Pittsburgh of \$2.16 a ton. We quote 50 per cent. ferrosilicon, in lots up to 100 tons, at \$73; over 100 tons to 600 tons, \$72; over 600 tons, \$71, delivered in the Pittsburgh district. We quote 10 per cent. ferrosilicon at \$20; 11 per cent., \$21, and 12 per cent., \$22, f.o.b. cars Jackson County, Ohio, or Ashland, Ky., furnaces. We quote 20 per cent. spiegeleisen at \$25 at furnace. We quote ferrotitanium at 8c. per lb. in carloads; 10c. in 2000-lb. lots and over, and 12½c. in less than 2000-lb. lots.

Structural Material.—A great deal of large work is under way and being figured on, but actual orders placed in the past week were light. The John Eichleay, Jr., Company has taken 500 tons for an office building for the Delaware & Hudson Railroad at Albany, N. Y., and the American Bridge Company 250 tons for a new building for the General Chemical Company at Marcus Hook, Pa. Large work in the market includes 8000 tons for an office building for the Great Northern Railway at St. Paul and the Memphis Railroad bridge across the Mississippi River about 22,000 tons. The local telephone building, about 8000 tons, has not yet been placed. Prices are firm and we quote beams and

channels up to 15 in. at 1.25c., f.o.b. Pittsburgh, but on a very desirable tonnage for prompt shipment 1.20c. could be done. On small lots as high as 1.30c. is being asked.

Iron and Steel Bars.—Orders for both iron and steel bars have quieted down the past week, due partly to the severe winter weather and also because most consumers are covered for this and next month and some through second quarter. Mills report that specifications are coming in freely. The building outlook for this year is regarded as good, and the consumption of reinforcing steel bars is expected to be heavy. We quote steel bars for prompt shipment at 1.20c. to 1.25c., the latter price for delivery in second quarter. We quote iron bars at 1.40c. to 1.45c., f.o.b., maker's mill f.o.b., Pittsburgh. Extras for twisting reinforcing bars over the base price are as follows: $\frac{3}{4}$ in. and over, \$1; $\frac{1}{2}$ to 1 1/16 in., \$1.50; under $\frac{1}{2}$ in., \$2.50 per ton. These extras are charged by mills that roll bars from billets, but those rolling bars from old rails are not so strict.

Sheets.—The demand is fairly active, but most consumers are covered for this and next month and in some cases pretty well through second quarter. Mills report specifications good and shipments heavy. The American Sheet & Tin Plate Company is operating to about 80 per cent. of its hot sheet mill capacity, and other makers are running from 75 to 90 per cent. It is said that all the mills are holding No. 28 black at 2c. and No. 28 galvanized at 3c. for second quarter. The leading maker has not yet opened its books for orders for second quarter and some in the trade take this as an indication that an advance in prices may be made in the near future. For delivery in first quarter we quote No. 28 Bessemer black sheets at 1.95c. to 2c.; No. 28 galvanized, 2.95c. to 3c.; Nos. 9 and 10 blue annealed sheets, 1.45c.; No. 28 tin mill black plate, H. R. and A., 1.90c. to 1.95c.; Nos. 29 and 30, 1.95c. to 2c. These prices are f.o.b. Pittsburgh, in carload and larger lots, jobbers charging the usual advances for small lots from store.

Tin Plate.—Orders are light, as large consumers are well covered for this year. Specifications against contracts from the Pacific coast trade are coming in freely and shipments are heavy. Mills are running from 80 to 90 per cent. of capacity while several report they are running full. We quote 100-lb. cokes at \$3.30 to \$3.40 and 100 lb. ternes from \$3.20 to \$3.30 per base box f.o.b., Pittsburgh.

Wire Products.—Specifications have quieted down in the past week or two, but this is regarded as seasonable, as jobbers and consumers have replenished stocks and are pretty well covered for the next 60 days. Orders taken by the mills for wire and wire nails at present prices have been light, as consumers covered for at least 60 days before these prices were established. We quote: Wire nails, \$1.60; plain annealed wire, \$1.40; galvanized barb wire and fence staples, \$2; painted barb wire, \$1.60, all per 100 lb. f.o.b., Pittsburgh, with actual freight charge to point of delivery, terms being 30 days net less 2 per cent. off for cash in 10 days. We quote cut nails at \$1.60 to \$1.65, f.o.b., Pittsburgh. Discounts on woven wire fencing are 74 per cent. off in carload lots, 73 per cent. off on 1000-rod lots and 72 per cent. on less than 1000-rod lots, all f.o.b., Pittsburgh.

Spikes.—This trade is more active than for some time, and inquiries are heavy. Some of the leading railroads have covered for practically their entire spike needs for this year. We quote standard sizes of railroad spikes in large lots at \$1.45 to \$1.50 and small railroad and boat spikes at \$1.55 to \$1.60 per 100 lb., f.o.b., Pittsburgh.

Hoops and Bands.—The demand is quiet as consumers have covered for some time ahead. Mills report specifications coming in quite freely. The Carnegie Steel Company is holding bands at 1.25c. minimum for delivery in this and second quarter. We quote steel bands at 1.20 to 1.25c., the lower price being for prompt shipment, with extras as per the steel bar card, and steel hoops at 1.30c., f.o.b. Pittsburgh.

Shafting.—Nearly all consumers having covered through the first half, the new demand is mostly for

small lots. Makers report specifications from the automobile trade as coming in quite freely, but not so well from the implement trade. We quote cold-rolled shafting in carload and larger lots at 63 to 64 per cent. and in small lots from 60 to 62 per cent. off delivered in base territory, depending on the order. One local maker of shafting is not quoting below 63 per cent. off in large lots.

Nuts, Bolts and Rivets.—Most buyers of nuts and bolts covered some time ago when prices were lower, but the demand is active for small lots. The demand for rivets is fair, but not heavy, the boiler shops and other consumers not being very busy. We quote button-head structural rivets at \$1.65 to \$1.70 and cone-head boiler rivets at \$1.75 to \$1.80, in carload lots, an advance of \$2 to \$3 a ton over these prices being charged for small lots, depending on the order. Terms are 30 days net, less 2 per cent. for cash in 10 days. Discounts on nuts and bolts are as follows in lots of 300 lb. or over, delivered within a 20c. freight radius of makers' works:

Coach and lag screws.....	80 and 5% off
Small carriage bolts, cut threads.....	80% off
Small carriage bolts, rolled threads.....	80 and 5% off
Large carriage bolts.....	75 and 5% off
Small machine bolts, cut threads.....	80 and 5% off
Small machine bolts, rolled threads.....	80 and 10% off
Large machine bolts.....	75 and 10% off
Machine bolts, c.p.c. & t nuts, small.....	80% off
Machine bolts, c.p.c. & t nuts, large.....	75 and 5% off
Square h.p. nuts, blanked and tapped.....	\$6.30 off list
Hexagon nuts.....	\$7.20 off list
C.p.c. & r sq. nuts, blanked and tapped.....	\$6.00 off list
Hexagon nuts, $\frac{3}{4}$ and larger.....	\$7.20 off list
Hexagon nuts, smaller than 9/16.....	\$7.20 off list
C.p. plain square nuts.....	\$7.80 off list
C.p. plain hexagon nuts.....	\$5.50 off list
Semi-fin. hex. nuts, $\frac{3}{4}$ and larger.....	85 and 5% off
Semi-fin. hex. nuts, smaller than 9/16, 85, 10 & 10% off	
Rivets, 7/16 x 6 1/2, smaller and shorter.....	80, 10 & 5% off
Rivets, metallic tinned, bulk.....	80, 10 and 5% off
Rivets, tin plated, bulk.....	80, 10 and 5% off
Rivets, metallic tinned, packages.....	80, 10 and 5% off
Standard cap screws.....	70, 10 and 10% off
Standard set screws.....	75, 10 and 10% off

Merchant Steel.—Two leading makers report that new demand is more active than at any time since last summer. Jobbers and consumers have covered for this and next quarter in some cases, and are specifying freely. Prices are firm and we quote: Iron finished tire, $\frac{1}{2}$ x 1 1/2 in. and larger, 1.35c., base; under $\frac{1}{2}$ x 1 1/2 in., 1.50c.; planished tire, 1.55c.; channel tire, $\frac{3}{4}$ to $\frac{1}{2}$ and 1 in., 1.85c. to 1.95c.; 1 1/2 in. and larger, 1.95c.; toe calk, 1.95c. to 2.05c., base; flat sleigh shoe, 1.70c.; concave and convex, 1.75c.; cutter shoe, tapered or bent, 2.25c. to 2.35c.; spring steel, 1.95c. to 2.05c.; machinery steel, smooth finish, 1.80c. We quote cold-rolled strip steel as follows: Base rates for 1 in. and 1 1/2 in. and wider, under 0.20 carbon, and No. 10 and heavier, hard temper, 3.25c.; soft, 3.50c.; coils, hard, 3.15c.; soft, 3.40c.; freight allowed. The usual differentials apply for lighter sizes.

Standard Pipe.—The heavy snows and cold weather have checked new demand. However, several mills report that actual orders for lap and butt weld pipe so far this month show a slight increase over the same period in January. No large oil or gas lines are yet in the market. As a rule pipe mills are operating at 75 per cent. of capacity. Discounts on iron and steel pipe are being fairly well observed.

Boiler Tubes.—New demand is dull, as locomotive and boiler shops are not busy. It is said that discounts are being held.

Coke.—The local market continues quiet, with makers of best furnace coke holding firm for \$2 and one leading maker asking \$2.10 for second quarter delivery. The Maryland Steel Company is arranging to start two of its blast furnaces at Sparrows Point, Md., and has inquiries out in the local market for a considerable tonnage of coke. We note a sale of 10,000 tons of standard grade furnace coke for March shipment at \$2 per ton at oven. The market on prompt furnace coke is weaker, and two Cleveland furnace interests have been able to buy from time to time all the furnace coke they need at \$1.75 to \$1.80, but it is claimed that all of this coke was not strictly high grade. There is only a fair demand for foundry coke, and the market is firm. We quote strictly standard furnace coke for this month and March shipment at \$2 per net ton at oven. Other grades of furnace coke not so high in quality can be

had at \$1.75 up to \$1.85 per net ton at oven. We quote strictly standard foundry coke at \$2 per net ton at oven to consumers, but some grades are selling at \$2.30 to \$2.35 at oven. Output of coke in the Upper and Lower Connellsville regions last week was 300,250 tons, a decrease over the previous week of 4725 tons.

Old Material.—The local scrap market has quieted down considerably and prices are weaker. Heavy steel scrap sold up as high as \$13.25 in a few cases, but it is offered freely now as low as \$12.75. Consumers are pretty well covered, and it is believed the next month or so in the scrap trade will be quiet, with probably some decline in prices. We note a sale of 400 tons of machine shop turnings at \$9 and 250 tons of borings at the same price, delivered at buyers' mills in the Pittsburgh district. Dealers are quoting as follows per gross ton for delivery in the Pittsburgh and other districts:

Selected heavy steel scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	\$12.75 to \$13.00
Compressed side and end sheet scrap	11.50 to 11.75
No. 1 foundry cast	12.00 to 12.25
No. 2 foundry cast	11.00 to 11.25
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	9.75 to 10.00
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	14.00 to 14.25
No. 1 railroad malleable stock	11.25 to 11.50
Grate bars	8.00 to 8.25
Low phosphorus melting stock	15.50
Iron car axles	24.25 to 24.75
Steel car axles	17.25 to 17.50
Locomotive axles, steel	21.25 to 22.50
Locomotive axles, iron	25.25 to 25.75
No. 1 busheling scrap	12.00 to 12.25
No. 2 busheling scrap	8.00 to 8.25
Machine shop turnings	9.00 to 9.25
Old carwheels	11.75 to 12.00
Cast-iron borings	9.00 to 9.25
Sheet bar crop ends	13.25 to 13.50
Old iron rails	14.25 to 14.50
No. 1 railroad, wrought scrap	13.50 to 13.75
Heavy steel axle turnings	9.75 to 10.00
Stove plate	8.00 to 8.25

*These prices are f.o.b. cars at consumers' mills in the Pittsburgh district.
†Shipping point.

Chicago

CHICAGO, ILL., February 25, 1914.—(By Wire.)

The manner in which specifications against contracts placed since the first of the year are coming forward is the chief source of satisfaction just now. The lull in new business in both steel and pig iron is appreciable. The past week lacked any transactions of importance aside from the additional rail business placed by the Illinois Central, its total purchases now running to about 67,500 tons, of which some part will be rolled by the Illinois Steel Company. Other rail inquiry in this market totals about 25,000 tons. The demand for structural shapes continues steady, though the aggregate of contracts for fabrication placed during the week was less than 2000 tons. With the quieting down of demand the mills are displaying a little more eagerness for the business offering, and there is perhaps more of a disposition to meet buyers part way. Contracts for cast-iron pipe placed during the week amounted to 7000 tons. Pig iron sales were comparatively few and confined to small lots. Prices, however, are decidedly firmer. The scrap market has gravitated to a position more in keeping with the general situation and transactions are now being made without any great pressure either to buy or sell. Mill activity in this territory is about 70 per cent. of capacity. Store trade is better than might be expected.

Pig Iron.—Except for the inquiry for iron to be delivered in the last half, consumers' interest in pig iron in this market has fallen off to a marked degree. A local manufacturer of malleable castings in the market for 4000 to 6000 tons of malleable Bessemer is understood to have refrained from buying thus far. No transactions of important tonnage are reported closed. Local furnaces are apparently somewhat satisfied with their bookings at last, and the price of \$14.25 at the furnace seems now to be well established for new business, although some small orders of low

silicon malleable were placed on the books the past week on quotations of two or three weeks' standing at equivalent to \$14, delivered Chicago. Southern sellers likewise have found little business offering. The low point in quotations from the South now seems to be \$10.75, Birmingham, with \$11 asked for several grades of standard iron. Some low prices have been made the past week on charcoal iron, but buyers may expect a firmer attitude in this direction. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace and do not include a local switching charge averaging 50c. a ton:

Lake Superior charcoal, Nos. 1, 2, 3, 4	\$15.25 to \$15.75
Northern coke foundry, No. 1	14.75 to 15.00
Northern coke foundry, No. 2	14.25 to 14.75
Northern coke foundry, No. 3	14.00 to 14.25
Southern coke No. 1 f'dry and 1 soft	15.60 to 16.10
Southern coke, No. 2 f'dry and 2 soft	15.10 to 15.60
Southern coke, No. 3	14.60 to 15.10
Southern coke, No. 4	14.10 to 14.60
Southern gray forge	13.85 to 14.35
Southern mottled	13.35 to 13.85
Malleable Bessemer	14.00 to 14.50
Standard Bessemer	16.50
Basic	13.50 to 14.00
Jackson Co. and Kentucky silvery, 6 per cent.	16.90
Jackson Co. and Kentucky silvery, 8 per cent.	17.90
Jackson Co. and Kentucky silvery, 10 per cent.	18.90

Structural Material.—The lettings of the week included a bridge and two buildings at Kansas City aggregating 830 tons, distributed between the local shops. The Minneapolis Steel & Machinery Company took 500 tons for a theater at Minneapolis and 147 tons for a normal school at Cheney, Wash. The American Bridge Company will furnish 211 tons for a bridge in California. Other contracts brought the total for the week up to about 2000 tons. Preliminary figures are being asked on the Plankinton Hotel at Milwaukee, which will require about 6000 tons. A project is under way at Chicago for the building of a 14-story hotel at Madison and Canal streets. The Mt. Vernon Car Mfg. Company is placing about 2000 tons for 500 cars taken last week. Mill orders for shapes are holding up well. For Chicago delivery, from mill, we quote 1.38c. to 1.48c.

For Chicago delivery, from store, we quote 1.75c.

(By Mail)

Rails and Track Supplies.—Inquiry for rails concerns only moderate tonnages. The Great Northern is considering the purchase of 15,000 tons of rails and 10,000 kegs of spikes and another Western road is in the market for 6000 tons of rails. New business in spikes and bolts appears to be very desirable from the mill standpoint and the firmness of prices may be in some danger. We quote standard railroad spikes at 1.50c. to 1.55c., base; track bolts with square nuts, 2.05c. to 2.10c., base, all in carload lots, Chicago; tie plates, \$27 to \$28 net ton; standard section Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

Plates.—Some carload and mixed car business in plates is being placed at 1.38c., Chicago, but desirable tonnage will still bring out quotations \$1 a ton lower, and it is more than doubtful if so high a price has been realized on recent orders of car materials. Universal mill plates continue strongly on a parity with structural shapes. For Chicago delivery from mill for prompt and second quarter shipment, we quote 1.33c. to 1.38c.

Out of local jobbers' stocks we quote Chicago delivery on plates 1.75c.

Sheets.—Sheet tonnage, especially blue annealed, is plentiful, but whatever may be the reason there seems to be less insistence upon the full prices to which the market recently advanced. The dilatory tactics of the railroads in placing orders is reflected in the lack of specifications against sheet contracts where those contracts covered sheets for car construction. We quote for Chicago delivery from mill: No. 10 blue annealed, 1.63c.; No. 28 black, 2.18c.; No. 28 galvanized, 3.18c.

For sheets out of store we quote for Chicago delivery as follows, minimum prices applying on bundles of 25 or more: No. 10 blue annealed, 1.95c.; No. 28 black, 2.45c. to 2.55c.; No. 28 galvanized, 3.50c. to 3.60c.

Bars.—The mills continue well satisfied with their bookings of steel bars and the market is sound in this direction, 1.20c., Pittsburgh, being the common basis for quoting. For second quarter, less desirable specifications are likely to develop no better price than 1.25c. Bar-iron tonnage is appearing more freely and a somewhat improved price situation is accordingly noted. Shafting quotations present some irregularities. We quote for mill shipment as follows: Bar iron, 1.12½c. to 1.17½c.; soft steel bars, 1.38c. to 1.43c.; hard steel bars, 1.30c.; shafting in carloads, 65 per cent. off; less than carloads, 60 per cent. off.

We quote store prices for Chicago delivery: Soft steel bars, 1.65c.; bar iron, 1.65c.; reinforcing bars, 1.65c. base, with 5c. extra for twisting in sizes ½ in. and over and usual card extras for smaller sizes; shafting 57 per cent. off.

Hoops and Bands.—The mill at Alton, Ill., is running with comfortable schedules, and new business which attained record proportions in January bids fair to establish a similar record in February. We continue to quote for bands 1.38c., Chicago, with one-half standard classification extras, and hoops 1.48c., Chicago, full extras.

Rivets and Bolts.—A slight improvement in the demand for rivets, collateral to the activity in structural fabrication, is noted but this demand is still far below capacity in this market. We quote from mill as follows: Carriage bolts up to ¾ x 6 in., rolled thread, 80-5; cut thread, 80; larger sizes, 75-5; machine bolts up to ¾ x 4 in., rolled thread, 80-10; cut thread, 80-5; larger sizes, 75-10; coach screws, 80-15; hot pressed nuts, square head, \$6.20 off per cwt.; hexagon, \$7 off per cwt. Structural rivets, ½ to 1¼ in., 1.73c. to 1.78c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

Out of store we quote for structural rivets 2.40c. and for boiler rivets, 2.60c. Machine bolts up to ¾ x 4 in. 70-10-10; larger sizes 70-12½; carriage bolts up to ¾ x 6 in. 75-10; larger sizes 70-12½ off. Hot pressed nuts, square head, \$5.50, and hexagon, \$6.20 off per cwt.

Old Material.—The scrap market has subsided to a more normal and healthy state. Dealers have liquidated their long holdings to a considerable extent, have settled their profit and loss account and are now temporarily content to await evidence of a real buying demand on the part of consumers. The past week was quiet. New offering of railroad scrap approximated 14,000 tons and included 4000 tons from the Rock Island Lines, of which 1000 tons was steel rail, 600 tons No. 1 wrought and 200 tons wheels; 2700 tons from the Chicago, Burlington & Quincy, of which 1000 tons was No. 1 and No. 2 wrought; 3300 tons from the Chicago, Milwaukee & St. Paul, of which 500 tons was wheels; 2700 tons from the Grand Trunk, and 1000 tons from the Northern Pacific. We quote, for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton

Old iron rails	\$13.25 to \$13.75
Old steel rails, rerolling	12.00 to 12.50
Old steel rails, less than 3 ft.	11.25 to 11.75
Relaying rails, standard section, subject to inspection	24.00
Old carwheels	12.25 to 12.75
Heavy melting steel scrap	10.25 to 10.75
Frogs, switches and guards, cut apart	10.25 to 10.75
Shoveling steel	9.75 to 10.25
Steel axle turnings	7.25 to 7.75

Per Net Ton

Iron angles and splice bars	\$13.25 to \$13.75
Iron arch bars and transoms	13.25 to 13.75
Steel angle bars	9.75 to 10.25
Iron car axles	18.50 to 19.00
Steel car axles	13.00 to 13.50
No. 1 railroad wrought	9.50 to 10.00
No. 2 railroad wrought	9.25 to 9.50
Cut forge	9.25 to 9.75
Steel knuckles and couplers	9.75 to 10.25
Steel springs	10.50 to 10.75
Locomotive tires, smooth	10.75 to 11.25
Machine shop turnings	5.50 to 6.00
Cast borings	5.25 to 5.75
No. 1 busheling	8.25 to 8.75
No. 2 busheling	6.50 to 7.00
No. 1 boilers, cut to sheets and rings	6.50 to 7.00
Boiler punchings	9.25 to 9.75
No. 1 cast scrap	10.75 to 11.25
Stove plate and light cast scrap	9.75 to 10.25
Grate bars	9.50 to 10.00
Railroad malleable	10.25 to 10.75
Agricultural malleable	9.00 to 9.50
Pipes and flues	7.75 to 8.25

Cast-Iron Pipe.—With the advance of the regular

season for contracting for cast-iron pipe, the demand seems to be approximately normal. The United States Cast Iron Pipe & Foundry Company has been awarded 700 tons at Kansas City, 1300 tons at Duluth, 300 tons by the South Park Commission and is the low bidder on 2600 tons at Akron, Ohio. The Lynchburg Foundry Company took 600 tons at Grand Rapids, Mich., and the American Cast Iron Pipe Company 400 tons at Rockford, Ill. Lettings announced for the current week include 1000 tons at Evansville, Ind., 160 to 300 tons at Saginaw, Mich., and 125 tons at Springfield, Ohio. Prices are firm. We quote as follows, per net ton, Chicago: Water pipe, 4 in., \$27; 6 to 12 in., \$25; 16 in. and up, \$24, with \$1 extra for gas pipe.

Wire Products.—The rate at which consumers were ordering wire in various forms in January, while hardly maintained the past few weeks, is still sufficient to develop a healthy volume of business. We quote to jobbers as follows: Plain wire No. 9 and coarser, base, \$1.58; wire nails, \$1.78; painted barb wire, \$1.78; galvanized, \$2.18; polished staples, \$1.78; galvanized, \$2.13, all Chicago.

Philadelphia

PHILADELPHIA, PA., February 24, 1914.

The movement in both foundry and steel-making grades of pig iron continues active. Prices are stronger, and on some sales advances over recent quotations have been obtained. Indications now point to quieter conditions. A moderate movement in billets continues, with prices well maintained. Finished materials are practically unchanged; in some lines specifications have been better but new business is a shade quieter. Prospective business in ship materials is not so large as reported, at least from local yards. A better volume of structural work is ahead. Sheets and bars have been in fair demand, particularly for early delivery. The coke movement is less active but prices have gained strength. Old material has been quiet.

Iron Ore.—While there have been no actual negotiations, reports of tentative inquiries are heard. Most furnaces carried over large quantities of ore from last year. Importations the week ended February 21 included 12,340 tons from Sweden, 4100 tons from Cuba and 6400 tons from Africa.

Pig Iron.—Quite heavy sales against pending negotiations have been concluded in both foundry and steel-making grades. Prices show increasing strength but the outlook for continued buying is not so promising. A lull, however, would not be unexpected following the recent heavy movement, as consumers are now pretty well covered, particularly the larger buyers, for a large part of their first half requirements. In foundry grades the most important transaction was that of the Pennsylvania Railroad, which is understood to have taken its maximum inquiry, aggregating 7500 tons, of mixed grades, including 1700 tons of charcoal, for second quarter delivery at Altoona. The bulk of this business went to central and western Pennsylvania furnaces. In the higher foundry grades the bulk of the sales in this district have been in moderate lots, largely for near future shipment at prices ranging from \$15 to \$15.50 delivered. The inside quotation now appears to be established as absolute minimum for standard brands of No. 2 X. Several producers have made fair sales at \$15.25 and some little \$15.50 iron has been sold. A moderate amount of business for second quarter has been taken at \$15.50 delivered for No. 2 X. In the lower foundry grades a sale of 5000 tons was made to a Delaware River pipe maker. This covered both No. 3 foundry and gray forge, the average price being \$14.50 delivered. Other cast-iron pipe makers have been buying odd lots. Virginia foundry irons have not been very active. Moderate lot sales for near future delivery are made at \$12.75 at furnace, covering both No. 2 X and No. 2 plain. Some furnaces hold at \$13 for 60-day delivery and \$13.25 for strictly second quarter. Rolling mill forge is quiet. Further sales against pending negotiations for basic iron have been made. A central Pennsylvania consumer is reported to have

closed for 5000 to 6000 tons at \$14.50 delivered. An eastern Pennsylvania melter purchased upward of 10,000 tons, a part of which is understood to have been on a trade deal. Producers of basic are now disposed to hold more firmly at \$14.50 for that grade, but most of the heavy buying for the remainder of the first half has now been closed. Moderate sales of standard analysis low-phosphorus iron have been made for near future shipment at \$21 delivered, which now flatly represents the market. General pig-iron inquiry during the week has been almost wholly for small lots, although the Baldwin Locomotive Works has an inquiry out for several thousand tons of foundry. The following range of prices represents the market for standard brands, delivered in buyers' yards, in this vicinity:

Eastern Penna. No. 2 X foundry.....	\$15.00 to \$15.50
Eastern Penna. No. 2 plain.....	14.75 to 15.25
Virginia No. 2 X foundry.....	15.55 to 16.00
Virginia No. 2 plain.....	15.55 to 16.00
Gray forge.....	14.00
Basic.....	14.25 to 14.50
Standard low phosphorus.....	21.00

Ferroalloys.—The current demand for ferromanganese has been light. Small sales of English 80 per cent. for early delivery have been made at \$39, seaboard. Sales of German have been made for Western shipment at \$38. Forward ferromanganese is generally held at \$40, seaboard.

Billets.—New business is quiet. Few inquiries for contract steel have developed but a moderate amount of current business is moving. Specifications are fairly good and mill operations are being maintained. Prices are firm, basic open-hearth rolling steel being held at \$23.40 to \$24.40 here, with forging steel commanding an advance of \$4 to \$5 a ton, according to specification.

Plates.—Miscellaneous business continues on a fairly even basis and some small contracts have been entered. Reports that four new boats had been placed with Delaware River shipyards, which would require a heavy tonnage of plates, are stated as being without foundation. Makers are encouraged, however, with the outlook for plates for structural work. While forward contracts are in instances entered on a 1.40c. basis, delivered here, makers find it difficult to get that price for early delivery, except in small lots, 1.35c. here still ruling as the general quotation.

Structural Material.—The outlook for fabricated work is somewhat brighter. Requirements for the proposed new Widener Building in this city are now fixed at close to 10,000 tons, the contract for which is not expected to be long delayed. Improvements in southern Philadelphia, covering grade crossing removals and elevated work will require some 5000 tons. A larger variety of bridge work is being estimated upon, while the Pennsylvania Railroad has an inquiry out for 900 tons of material for use in connection with the electrification of its main line to Paoli. A moderate volume of business in plain shapes is coming to the mills in this district. While prices are no higher, a little more firmness at 1.35c. to 1.40c. delivered here is noted.

Sheets.—Orders coming to the Eastern mills have been fair, most makers being covered for a month or more ahead but find it difficult to obtain specifications to insure rolling schedules more than a week in advance. The bulk of the buying recently has been for early delivery. Prices are strong but unchanged at 1.55c. to 1.60c. delivered here for No. 10 blue annealed sheets.

Bars.—Business continues in fair volume although confined mostly to small orders. Bar-iron makers are holding prices more firmly, in view of higher cost of raw material. Ordinary iron bars are firm at 1.27½c. delivered here as a minimum, with the better grades commanding 1.32½c. to 1.35c. Steel bars are moderately active at unchanged prices.

Old Material.—Business has been lighter, owing to unfavorable weather conditions. Generally the market remains firm and the tone strong. One large Eastern consumer has entered the market for 10,000 tons of heavy melting steel, offering present market quotations, at which sellers refuse to make sales. Rolling-mill grades have been quiet and there has been little movement in specialties. Preliminary steps for the forma-

tion of an association of scrap dealers and brokers were taken at a meeting held at the Continental Hotel on February 19. The following quotations about represent the market for deliveries in buyers' yards in this district, covering eastern Pennsylvania and taking freight rate varying from 35c. to \$1.35 per gross ton:

No. 1 heavy melting steel.....	\$11.00 to \$11.50
Old steel rails, rerolling.....	13.50 to 14.00
Low phosphorus heavy melting steel scrap (nominal).....	14.50 to 15.00
Old steel axles.....	17.00 to 17.50
Old iron axles.....	23.00 to 24.00
Old iron rails.....	16.50 to 17.00
Old carwheels.....	12.75 to 13.25
No. 1 railroad wrought.....	14.50 to 15.00
Wrought-iron pipe.....	11.00 to 11.50
No. 1 forge fire.....	10.00 to 10.50
Bundled sheets.....	10.00 to 10.50
No. 2 light iron (nominal).....	5.00
No. 2 busheling (nominal).....	8.50 to 9.00
Wrought turnings.....	9.25 to 9.75
Cast borings.....	9.50 to 10.00
Machinery cast.....	13.00 to 13.50
Grate bars, railroad.....	9.50 to 10.00
Stove plate.....	10.00 to 10.50
Railroad malleable.....	10.00 to 10.50

Coke.—Negotiations are still pending for a considerable tonnage of second quarter furnace coke. Producers are holding prices more firmly and in instances small advances in prices have been obtained. Contract furnace coke ranges from \$2 to \$2.10 at oven, while prompt ranges from \$1.85 to \$2. Foundry coke is practically unchanged at \$2.50 to \$3, according to grade. For delivery in buyers' yards, prices per net ton range about as follows:

Connellsville furnace coke.....	\$3.90 to \$4.40
Connellsville foundry coke.....	4.80 to 5.15
Mountain furnace coke.....	3.60 to 4.10
Mountain foundry coke.....	4.50 to 4.85

Cleveland

CLEVELAND, OHIO, February 24, 1914.

Iron Ore.—One vessel interest has taken contracts to move 1,000,000 tons of ore in 1914 at the 1913 rate of 55c. However, it is not generally considered that this business has definitely established the carrying charges on the 1913 basis. Some shippers are inclined to think that ore rates will be lower than a year ago, because the expected light movement will leave more vessel capacity available than will be required. We quote 1913 prices as follows: Old Range Bessemer, \$4.40; Mesaba Bessemer, \$4.15; old range non-Bessemer, \$3.50; Mesaba non-Bessemer, \$3.40.

Pig Iron.—The market is quiet, but firm. Cleveland furnaces have further advanced prices 25c. a ton for local delivery and 50c. for outside shipment and are now quoting No. 2 foundry at \$14 at furnace for delivery in Cleveland and other points. The stiffening in prices is due to the fact that local furnaces are comfortably filled up with low priced orders and they do not care to take on additional tonnage without a fair margin of profit. Recent price advances have checked buying and few sales and inquiries are reported. The United Steel Company Canton, Ohio, is in the market for 10,000 tons of basic for the last half, but some sellers have declined to quote at present for that delivery. Southern iron is firm at \$10.75 to \$11 for Birmingham No. 2. A few small lot sales are reported. We quote delivered Cleveland as follows:

Bessemer.....	\$15.15
Basic.....	14.00
Northern No. 2 foundry.....	\$14.00 to 14.25
Southern No. 2 foundry.....	15.10 to 15.35
Gray forge.....	13.00
Jackson County silvery, 8 per cent. silicon.....	17.30 to 17.55

Coke.—The market is quiet. Some prompt shipment furnace coke is being offered at \$1.75 per net ton at oven and other prices range up to \$2. For the last half \$2.25 is the general asking price for the best grades. Prices on foundry coke are unchanged at \$2.50 to \$2.75.

Finished Iron and Steel.—Specifications have fallen off considerably, as was expected, owing to the heavy volume of orders accompanied by specifications placed in the preceding few weeks. This lull has to some extent been offset by a better volume of new inquiry for steel for specific work. Several round lot tonnages are being figured on. Additions to the Willys-Overland plant, Toledo, will require 1700 tons of reinforcing

bars in addition to the structural steel contract reported last week. T. H. Brooks & Co. have taken 1200 tons of steel for the new plant of the Cleveland-Akron Bag Company, Cleveland, which will also require 500 tons of reinforcing bars. Prices on steel bars, plates and structural material appear to be slowly stiffening up to the 1.25c. Pittsburgh basis, although on desirable orders for early delivery buyers are still having little trouble in getting a 1.20c. quotation. Bar iron is weak and in light demand. While the general quotation is 1.20c. Cleveland, a desirable order might bring out a lower price. Sheet prices continue irregular. Some Ohio mills are making quotation of 1.90c. for No. 28 black and 2.90c. for No. 28 galvanized for desirable orders and on blue annealed sheets an order has just been placed with a Valley mill at slightly lower than 1.40c. for No. 10. Stock prices are 1.80c. for steel bars and 1.90c. for plates and structural material.

Bolts and Rivets.—Jobbers are starting to contract for bolts and nuts for second quarter at prevailing quotations, which are being well maintained. New demand for rivets is light and quotations are unchanged at 1.65c. for structural rivets and 1.75c. for boiler. We quote mill discounts as follows: Common carriage bolts, $\frac{1}{2}$ x 6 in. smaller or shorter, rolled thread, 80 and 5 per cent.; cut thread, 80 per cent.; larger or longer, 75 and 5 per cent.; machine bolts with h.p. nuts, $\frac{1}{2}$ x 4 in., smaller or shorter, rolled thread, 80 and 10 per cent.; cut thread, 80 and 5 per cent.; larger or longer, 75 and 10 per cent.; coach and lag screws, 80 and 15 per cent.; square h.p. nuts, blank or tapped, \$6.30 off; hexagon h.p. nuts, blank or tapped, \$7.20 off; c. p. c. and t. square nuts, blank or tapped, \$6 off; hexagon, $\frac{1}{2}$ in. and larger, \$7.20 off; $\frac{9}{16}$ in. and smaller, \$7.80 off; semi-finished hexagon nuts, $\frac{1}{2}$ in. and larger, 85, 10 and 5 per cent.; $\frac{9}{16}$ in. and smaller, 85, 10, 10 and 5 per cent.

Old Material.—The dullness following the recent active market has caused a softening of prices and several grades are being quoted at about \$1 a ton lower than the maximum prices two weeks ago. The weakness is particularly noticeable in the heavy melting steel, steel axles, turnings and railroad wrought. Local mills have reduced prices offered for heavy melting steel to \$11, to \$11.50. Mills appear to be well supplied at present. Little scrap is being shipped because of weather conditions. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton	
Old steel rails, rerolling.....	\$12.00 to \$12.50
Old iron rails	13.50 to 14.00
Steel car axles	16.00 to 16.25
Heavy melting steel	11.00 to 11.50
Old carwheels	12.00 to 12.50
Relaying rails, 50 lb. and over	23.00 to 25.00
Agricultural malleable	9.00 to 9.50
Railroad malleable	11.50 to 11.75
Light bundled sheet scrap	7.00 to 7.50
Bundled tin scrap	11.00 to 11.50

Per Net Ton	
Iron car axles	\$20.00 to \$21.00
Cast borings	6.75 to 7.25
Iron and steel turnings and drillings	6.00 to 6.50
Steel axle turnings	7.00 to 7.50
No. 1 busheling, new	9.75 to 10.25
No. 1 busheling, old	9.00 to 9.25
No. 1 railroad wrought	11.00 to 11.50
No. 1 cast	11.50 to 11.75
Stove plate	9.00 to 9.25

Cincinnati

CINCINNATI, OHIO, February 24, 1914.—(By Wire.)

Pig Iron.—The reluctance of both Northern and Southern furnace men to open their books formally for last half foundry business has tended to slow up negotiations. Although a number of contracts have been made with shipments extending into the third quarter, none has been booked at the minimum quotation given below. With the exception of a small lot of Tennessee warrant iron, nothing better than \$10.75, Birmingham basis, can be done here, and the majority of the furnace interests will not take less than \$11 for any shipment running up to July 1. Prices in the Hanging Rock district are also firmer, and \$13, Ironton, is considered absolute minimum for nearby shipments, while as far as known \$13.50 is the best that can be done for last half delivery. A reported tendency to advance prices

in other districts has not been without a favorable effect here. The largest general inquiry out is from a Michigan melter for 1000 tons of Northern foundry iron. Another Michigan manufacturer wants 500 tons of Ohio silvery iron. Both are for first half shipment. There is considerable unclosed business in Indiana but most of it is for third and fourth quarter. A southern Indiana foundry bought 1000 tons of Northern foundry iron and a central Indiana company took 500 tons for shipment over the next four months. A Kentucky melter bought 700 tons of Lake Superior charcoal iron for delivery throughout the remainder of this year. Malleable is slow and unchanged at \$13, Ironton. Based on freight rates of \$3.25 from Birmingham and \$1.20 from Ironton we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.....	\$14.50 to \$15.00
Southern coke, No. 2 f'dry and 2 soft.....	14.00 to 14.50
Southern coke, No. 3 foundry.....	13.50 to 14.00
Southern, No. 4 foundry.....	13.00 to 13.50
Southern gray forge	12.50 to 13.00
Ohio silvery, 8 per cent. silicon.....	17.20 to 17.70
Southern Ohio coke, No. 1.....	15.20 to 15.70
Southern Ohio coke, No. 2.....	14.20 to 14.70
Southern Ohio coke, No. 3.....	13.95 to 14.20
Southern Ohio malleable Bessemer.....	14.20 to 14.70
Basic, Northern	14.20 to 14.70
Lake Superior charcoal.....	16.25 to 17.25
Standard Southern carwheel.....	27.25 to 27.75

(By Mail)

Coke.—There has been no contracting for furnace coke lately in this territory. While iron producers in the Hanging Rock district are said to have a fairly good supply, later on some of them will have to buy to round out the last quarter of the year. Shipments on both furnace and foundry contracts are being held up on account of the weather, but up to the present time there have been few urgent complaints, except from foundries whose stocks were low. Connellsville furnace coke is unchanged around \$1.90 to \$2, and foundry at \$2.40 to \$2.55. Wise County and Pocahontas producers continue to hold out for an advance of about 15c. a ton above the figures named.

Finished Material.—The best reports are from the manufacturers and dealers in black and galvanized sheets. The demand is holding up remarkably well. The mills are not yet willing to make any long time contracts at present prices. Specifications on contracts are coming in better than expected, and taking everything as a whole this particular branch of the business can well be said to show an improvement. The local warehouse trade in steel bars and small structural shapes is at a standstill, as deliveries cannot be made. We continue our quotations of 2.15c. to 2.20c. on No. 28 black sheets and 3.15c. to 3.20c. on galvanized, both f.o.b. cars Newport, Ky., or Cincinnati. Steel bars remain around 1.75c. to 1.80c. from local stocks and small structural material at 1.85c.

Old Material.—The demand is spotty. Several grades show a small advance, while others are lower, especially borings and turnings, due to a large quantity being offered with a limited demand from users. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices, f.o.b. at yards:

Per Gross Ton	
Bundled sheet scrap	\$7.50 to \$8.00
Old iron rails	12.50 to 13.00
Relaying rails, 50 lb. and up.....	20.50 to 21.00
Rerolling steel rails	11.50 to 12.00
Melting steel rails	10.00 to 10.50
Old carwheels	11.00 to 11.50

Per Net Ton	
No. 1 railroad wrought	\$9.50 to \$10.00
Cast borings	5.25 to 5.75
Steel turnings	5.25 to 5.75
No. 1 cast scrap	10.00 to 10.50
Burnt scrap	6.75 to 7.50
Old iron axles	17.50 to 18.00
Locomotive tires (smooth inside).....	10.50 to 11.00
Pipes and flues	7.00 to 7.50
Malleable and steel scrap.....	8.00 to 8.50
Railroad tank and sheet scrap.....	6.00 to 6.50

The Dornhoff & Joyce Company, Cincinnati, has renewed its contract with the Citizens Gas Company, Indianapolis, for the exclusive sale of all the by-product coke produced at both of its plants in that city. At the Prospect street plant the Otto-Hoffman oven is used

while at the Langsdale avenue plant a new set of Solvay ovens has been installed and was fired a few days ago. These two operations will produce approximately 400,000 tons of coke annually. About 65 per cent. of this quantity will be foundry and metallurgical coke and 35 per cent. sold to coal dealers for domestic purposes. Both plants are being operated at full capacity.

Boston

BOSTON, MASS., February 24, 1914.

Old Material.—Few transactions are reported, and the market seems a little weaker, though prices are unchanged. One influence undoubtedly is the fact that deliveries could not be made even should orders be placed in any volume, so deeply are the yards buried in snow. The quotations given below are based on prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points which take Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of \$2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices:

Heavy melting steel.....	\$8.75 to	\$9.00
Low phosphorus steel.....	13.75 to	14.75
Old steel axles	13.25 to	13.75
Old iron axles	21.25 to	21.75
Mixed shafting	12.75 to	13.00
No. 1 wrought and soft steel.....	9.00 to	9.25
Skeleton (bundled)	6.00 to	6.50
Wrought-iron pipe	8.25 to	8.50
Cotton ties (bundled)	7.25 to	7.75
No. 2 light	3.75 to	4.25
Wrought turnings	5.50 to	6.00
Cast borings	5.75 to	6.25
Machinery, cast	11.25 to	11.50
Malleable	8.00 to	8.25
Stove plate	7.75 to	8.00
Grate bars	6.25 to	6.50
Cast-iron carwheels	11.00 to	11.25

Birmingham

BIRMINGHAM, ALA., February 23, 1914.

Pig Iron.—Birmingham furnace operators continue to quote \$11 for No. 2 foundry, with one interest, which is well sold up, asking \$11.50 for the second quarter and making a few small sales at both figures for both deliveries. It is granted by furnacemen that any big business may yet be done on a basis of \$10.75, although none will admit making such transactions. Business in the past week, where details of transactions are known, was on the \$11 basis for small lots, figures on large sales not being procurable. One concern other than the leading interest has booked 80,000 to 90,000 tons since the first of the year, and two are not seeking business except at the \$11 level and are selling little. The home consumption of steel-making iron is increasing and additional stacks will probably go on basic in the early spring. A sale of 2500 tons of analysis iron was made above the market figures. As a general proposition, \$11 is the maximum price, and large business is done around \$10.75 with probably some resale and warrant iron going at less. We quote, per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft.....	\$11.25 to	\$11.50
No. 2 foundry and soft.....	10.75 to	11.00
No. 3 foundry	10.25 to	10.50
No. 4 foundry	10.00 to	10.25
Gray forge	9.75 to	10.00
Basic	10.50 to	10.75
Charcoal	23.50 to	24.00

Cast-Iron Pipe.—For the first time in many months makers of soil or sanitary pipe admit that conditions are something like satisfactory both in regard to contracts secured and prices obtained. Water pipe concerns are also doing a fair business with much evidence of further improvement. Southern construction activity is adding to the demand for pipe. We quote, per net ton, f.o.b. pipe yards, as follows: 4-in., \$22; 6-in. and upward, \$20, with \$1 added for gas pipe.

Coal and Coke.—The coal market is duller than it has been for a long time. The railroads have used and are using less coal and the winter has been mild. Do-

mestic mines are operated partially and with difficulty. Coke is almost a drug. Effort is being made by producers of good grades to sell it at \$3, with customers hard to secure even at that figure. Inactivity at foundries and the going out of some blast furnaces are the cause. We quote, per net ton, f.o.b. oven, as follows: Furnace coke, \$2.25 to \$2.50; foundry, \$3 to \$3.25.

Old Material.—There has been considerable activity and quoted prices have been obtained with more unanimity. We quote, per gross ton, f.o.b. yards, as follows:

Old iron axles (small)	\$14.50 to	\$15.00
Old steel axles (light).....	14.50 to	15.00
Old iron rails	13.00 to	13.50
No. 1 railroad wrought	10.00 to	11.00
No. 2 railroad wrought	8.50 to	9.00
No. 1 country wrought	8.00 to	8.50
No. 2 country wrought.....	9.50 to	10.50
No. 1 machinery cast.....	9.50 to	10.00
No. 1 steel scrap	8.00 to	8.50
Tram carwheels	9.50 to	10.00
Standard carwheels	10.50 to	11.00
Stove plate	8.00 to	8.50

St. Louis

ST. LOUIS, Mo., February 23, 1914.

Pig Iron.—Though there is still No. 2 Southern foundry obtainable at \$10.50, Birmingham, nearly all representatives have received orders to quote nothing below \$11, Birmingham, and in one or two instances \$11.50, though this is undoubtedly for the purpose of shutting off business. There is some evidence that part of the recent heavy purchases was bought through customers by speculative interests which are satisfied that iron will not soon go lower. Quotations beyond first half are generally refused. As matter stands now No. 2 foundry, Iron-ton basis, is quoted at \$13.25 minimum. No. 2 Chicago is quoted at \$14. Transactions were altogether in small lots, none rising above 500 tons.

Old Material.—Inquiry from the foundries and steel plants is being reinforced by some demand from the rolling mill quarters. The lists out were 3000 tons from the Burlington and 800 tons from the Northern Pacific. All the lists previously reported have been closed at top prices. We quote dealers' prices f.o.b. St. Louis as follows:

Per Gross Ton		
Old iron rails	\$12.00 to	\$12.50
Old steel rails, rerolling.....	12.00 to	12.25
Old steel rails, less than 3 ft.....	11.25 to	11.50
Relaying rails, standard section, subject to inspection	23.00 to	24.00
Old carwheels	12.00 to	12.25
No. 1 railroad heavy melting steel scrap	11.00 to	11.50
Shoveling steel	10.00 to	10.25
Frogs, switches and guards cut apart	11.00 to	11.25
Bundled sheet scrap	5.50 to	6.00

Per Net Ton		
Iron angle bars	\$11.00 to	\$11.50
Steel angle bars	9.50 to	10.00
Iron car axles	18.50 to	19.00
Steel car axles	13.50 to	14.00
Wrought arch bars and transoms.....	13.00 to	13.50
No. 1 railroad wrought.....	9.50 to	10.00
No. 2 railroad wrought.....	9.00 to	9.50
Railroad springs	9.50 to	10.00
Steel couplers and knuckles.....	9.50 to	10.00
Locomotive tires, 42 in. and over, smooth	10.50 to	11.00
No. 1 dealers' forge	8.00 to	8.50
Mixed borings	4.00 to	4.50
No. 1 busheling	8.50 to	9.00
No. 1 boilers, cut to sheets and rings.....	6.50 to	7.00
No. 1 cast scrap	10.50 to	11.00
Stove plate and light cast scrap.....	9.00 to	9.50
Railroad malleable	9.00 to	9.25
Agricultural malleable	8.50 to	9.00
Pipes and flues	7.00 to	7.25
Railroad sheet and tank scrap.....	7.00 to	7.25
Railroad grate bars	8.25 to	8.50
Machine shop turnings.....	5.50 to	6.00

Coke.—The week has been quiet but prices are a little firmer. By-product coke is quoted at the Connellsville basis.

Finished Iron and Steel.—Structural material has generally maintained the advanced price without difficulty. In standard section steel rails the business of the week was altogether in small orders for small repair and replacement work. Plates continue very dull. Bars are in normal request for the season, both ordinary and reinforcing.

Buffalo

BUFFALO, N. Y., February 24, 1914.

Pig Iron.—Producers report sales to consumers in this district as a little less than for the preceding week, but including outside districts the amount is about equal to the late weekly average. There is a growing tendency on the part of furnaces to stiffen prices. There has been practically an advance of 25 cents per ton on all lines, and while the schedules remain the same the new attitude is to quote more uniformly on the maximum rather than the minimum. Some users are drawing on their second-quarter quotas for current needs, although a number of foundries are still operating below normal capacity. One furnace interest reports that it is nearly fully sold for first half. A good demand for charcoal iron is noted. For prompt and first half delivery we quote as follows, f.o.b. furnaces:

No. 1 foundry	\$13.25 to \$13.50
No. 2 X foundry	13.00 to 13.25
No. 2 plain	13.00 to 13.00
No. 3 foundry	12.75 to 13.00
Gray forge	12.75 to 13.00
Malleable	13.00 to 13.50
Basic	13.50 to 14.00
Charcoal	15.50 to 16.50

Finished Iron and Steel.—The market is quieter, following the activities of the past few weeks. Liberal specifications are coming in against contracts and prices are being firmly held at 1.25c., Pittsburgh base, on bars, shapes and plates. There are several good inquiries for reinforcing bars for second quarter. A good volume of business is also reported in sheets, nails and wire products, with prices well maintained. The Binghamton high school, involving 850 tons, was awarded to C. H. Mitchell & Co., Binghamton. Plans have been completed by Esenwein & Johnson, architects, Buffalo, for a hotel taking 1200 tons in Hamilton, Ont., for which the Canadian Parkers, Ltd., has the general contract. Bids go in this week for 200 tons for the Husted Company's elevator on Buffalo River.

Old Material.—Buying has settled down to a more conservative basis, with fairly steady demand in all lines. The speculative element in trading on the part of dealers has largely disappeared, leaving a good volume of healthy business. Prices remain unchanged from last week's list. We quote as follows, per gross ton, f.o.b. Buffalo:

Heavy melting steel	\$10.50 to \$11.00
Bundled sheet scrap	6.75 to 7.25
No. 1 busheling scrap	9.50 to 10.00
No. 2 busheling scrap	7.00 to 7.50
Low phosphorus steel scrap	15.50 to 16.25
Iron rails	15.00 to 15.50
No. 1 railroad wrought	12.00 to 12.50
No. 1 railroad and machinery cast	12.00 to 12.50
Old steel axles	17.00 to 17.50
Old iron axles	22.50 to 23.00
Old carwheels	12.00 to 12.50
Railroad malleable	10.75 to 11.25
Locomotive grate bars	9.50 to 10.00
Wrought pipe	8.50 to 9.00
Machine shop turnings	6.50 to 7.00
Heavy steel axle turnings	8.25 to 9.00
Clean cast borings	6.75 to 7.25
Stove plate (net ton)	9.75 to 10.00
Bundled tin scrap	12.00

New York

NEW YORK, February 25, 1914.

Pig Iron.—The amount of new inquiry is relatively small. It is presumed that a considerable part of the 15,000 tons or more for which a large pump company was recently in the market has been placed, a portion of the business going to the Buffalo district and some of it to Ohio. Eastern sellers are interested in the recent offering along the Atlantic coast of foundry iron produced by the Dominion Iron & Steel Company, at Sydney, Nova Scotia. It has been reported that several thousand tons of this iron has been sold. On the other hand is the statement that while the iron has been generally offered, no considerable buying of it can be traced, though with no duty on it it could readily be introduced in competition with Alabama iron, its high phosphorus content being desirable in some foundry mixtures. It is reported that this Dominion iron has been quoted at 75 cents to \$1 below eastern Pennsylvania irons delivered in New England. It is understood

that arrangements have been made by one Eastern selling firm to bring in at Philadelphia iron shipped from Sydney, Philadelphia being an advantageous distributing point even for shipment to some parts of New England. Buffalo iron would have to sell at about \$12.50 at furnace for No. 2 X to compete at New England interior points with the Sydney product, though the latter, due to its percentage of phosphorus, is not strictly comparable with Buffalo iron. The general foundry situation in the East is unchanged. It does not appear, at least, that consumption of foundry iron has increased. Quite a little buying presumably has yet to be done for the second quarter and Buffalo furnaces apparently have considerable iron to offer for such delivery. While \$13 at Buffalo is now asked for No. 2 for delivery in the next three months, and \$14 for delivery after July 1, only the test of new transactions will determine whether these prices will be maintained. We quote Northern iron for tidewater delivery as follows: No. 1 foundry, \$15 to \$15.25; No. 2 X, \$14.75 to \$15; No. 2 plain, \$14.25 to \$14.50. Southern iron is on the basis of \$15.25 to \$15.50 for No. 1 and \$15 for No. 2.

Ferroalloys.—Extreme dullness characterizes the market for 80 per cent. ferromanganese. While there are numerous inquiries for small lots, actual sales have amounted to only 200 to 300 tons in the past week. The policy of the English producers as to prices does not follow any definite plan, most sales going at \$39 to \$40 seaboard, with a possible variation from this under certain conditions. Not much is heard of sales made by the domestic producer. Business in 50 per cent. ferro-silicon continues normal, with quotations at \$73, Pittsburgh, for carloads; \$72 for 100 tons, and \$71 for 600 tons and over.

Finished Iron and Steel.—In some quarters the opinion is expressed that the effect of the freight rate question is still sufficiently potent to prevent any material increase in new business, while from other sources comes the information that new business as well as specifications on contracts is better than it was during January. The severe weather has had a retarding effect on the filling of actual needs and on the initiation of new enterprises, especially of a structural nature. With all this, to say that the tendency for prices to stiffen is strong would be more or less of an exaggeration; nevertheless no weakness was detected. Firmness is rather the actual condition with a general expectation of increases as the season advances. In structural lines there are various projects before the market, mostly small ones, amounting to over 110,000 tons, the letting of any of which has been very slow. But few new inquiries have appeared in the last week. Those that were learned of are 1200 tons for five bridges for the New York Central; 250 tons for one bridge for the New York, New Haven & Hartford, at Woodlawn Junction, N. Y., and 1100 tons for the new Hotel Onondaga, Syracuse, N. Y., a decision on which is expected this week. Also 4000 tons for the Johnson-Kahn building, New York; 250 tons for a garage for the West End Brewing Company, Utica, N. Y.; 150 tons for turbine foundations for Seventy-fourth street power station of the Interborough Rapid Transit, and 7000 tons for a building for the Fulton Bag & Paper Company, Brooklyn. The following contracts have been let for railroad cars: 150 ore cars for the Anaconda Copper Company, and 40 mine cars for the Ray Consolidated Copper Company to the Pressed Steel Car Company. The same company has also secured the 400 gondola cars for the Virginia Southern Railroad of the Southern Railway system. The Florida East Coast Railroad has awarded 500 freight cars to the Mt. Vernon Car Company. New inquiries for cars before the market embrace 500 box cars for the Central of Georgia, 1000 gondola and 1500 box cars for the St. Louis & San Francisco Railroad, 1000 cars for the Cotton Belt Railroad and also a large number of various types of freight cars for the New York Central, bids on which are to go in March 4. We quote mill shipment for steel bars, plates and structural material for early shipment at 1.20c. to 1.25c., Pittsburgh, or 1.36c. to 1.41c., New York; iron bars, 1.30c. to 1.35c., New York. We quote iron and steel bars from store at 1.90c. to 1.95c., and shapes and plates, 1.95c. to 2c.

Cast-Iron Pipe.—Hartford, Conn., will open bids March 2 on 1430 tons, mainly small sizes. The city of Boston has thrown out the bids which were opened February 9 on 3550 tons and advertised a re-letting on which bids will be opened February 27. It is understood that no purchase has yet been made of the flexible joint 36-in. pipe for the Staten Island extension of the Catskill water supply. Private demand has relapsed into quietness. Carload lots of 6-in. are quoted at \$22 to \$23, per net ton, tidewater.

Old Material.—Transactions are few and small. Holders of old material are not willing to sell much at present prices, while consumers are either completely out of the market or making offers below the views of the sellers. Indications are appearing, however, of the early exhaustion of stocks at some of the steel works in eastern Pennsylvania, which may lead to a renewal of buying. Eastern markets are soft in sympathy with those of other sections, but so far no actual recession is reported in prices in this vicinity, which are continued as follows, per gross ton, New York:

Old girder and T rails for melting...	\$9.00 to	\$9.50
Heavy melting steel scrap.....	9.00 to	9.50
Relaying rails	21.50 to	22.00
Rerolling rails	11.00 to	11.50
Iron car axles	19.50 to	20.00
Steel car axles	13.50 to	14.00
No. 1 railroad wrought.....	11.50 to	12.00
Wrought iron track scrap.....	10.00 to	10.50
No. 1 yard wrought, long.....	9.50 to	10.00
No. 1 yard wrought, short.....	8.75 to	9.25
Light iron	4.00 to	4.50
Cast borings	6.50 to	7.00
Wrought turnings	6.50 to	7.00
Wrought pipe	8.75 to	9.25
Carwheels	12.00 to	12.50
No. 1 heavy cast, broken up.....	11.50 to	12.00
Stove plate	8.50 to	9.00
Locomotive grate bars	7.50 to	8.00
Malleable cast	8.00 to	8.50

Germany Clouds British Trade

Large Sale of German Pig Iron to Wales— America Buying Belgian and German Finished Steel

(By Cable)

LONDON, ENGLAND, February 25, 1914.

Buyers continue reticent, Germany being the restraining cause. German stocks of pig iron at the end of January are reported at 653,000 tons, against 243,000 tons at the same time last year, and increasing 38,000 tons in the month. The sale is reported of 10,000 tons of German hematite (Bessemer pig iron) to Wales at 66s. (\$16.05), c.i.f. America is buying small lots of Belgian and German finished steel and has been inquiring for special analysis semi-finished steel, in which, however, no business was done. Stocks of pig iron in Connal's stores are 130,366 gross tons, against 137,936 tons a week ago. We quote as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 13s. 3d. (\$3.22).

The following prices are per ton of 2240 lb.:

Cleveland pig-iron warrants (Tuesday), 50s. 6½d. (\$12.29), against 50s. 8d. (\$12.33) one week ago.

No. 3 Cleveland pig iron, makers' price, f.o.b. Middlesbrough, 51s. (\$12.41).

Hematite pig iron, f.o.b. Tees, 62s. 6d. (\$15.21).

Steel sheet bars (Welsh), delivered at works in Swansea Valley, £4 10s. (\$21.89).

Steel bars, export, f.o.b. Clyde, £6 (\$29.20).

Steel joists, 15-in., export, f.o.b. Hull or Grimsby, £5 17s. 6d. (\$28.59).

Steel shin plates, Scotch, delivered local yards, £6 17s. 6d. (\$33.46).

Steel black sheets, No. 28, export, f.o.b. Liverpool, £9 (\$43.80).

Steel rails, export, f.o.b. works port, £5 19s. (\$28.95).

The following prices are per export ton of 1015 kilos, equivalent to 2237.669 lb.:

German sheet bars, f.o.b. Antwerp, 81s. (\$19.70).

German 2-in. billets, f.o.b. Antwerp, 76s. (\$18.48).

German basic steel bars, f.o.b. Antwerp, £4 11s. to £4 12s. (\$22.14 to \$22.38).

German joists, f.o.b. Antwerp, £5 2s. to £5 5s. (\$24.82 to \$25.55).

Metal Market

NEW YORK, February 25, 1914.

The Week's Prices

Cents Per Pound for Early Delivery							
Copper, New York		Tin, New York		Lead, New York		Spelter, New York	
Feb.	Lake	Electro-lytic	New York	New York	St. Louis	New York	St. Louis
19.....	15.00	14.62½	39.75	4.00	3.87½	5.40	5.25
20.....	15.00	14.50	39.20	4.00	3.87½	5.40	5.25
21.....	15.00	14.50	.....	4.00	3.87½	5.40	5.25
24.....	15.00	14.50	38.60	4.00	3.87½	5.35	5.20
25.....	15.00	14.50	38.12½	4.00	3.87½	5.35	5.20

Copper is dull and lower. Tin has declined steadily and business has been light. Lead prices have held up but the market is dull. Demand for spelter has fallen off and quotations are down a few points. Antimony is unchanged, except that Cookson's is a little easier.

New York

Copper.—The market has been dull in the absence of demand from both Europe and America. While the producers of electrolytic are understood to be holding to 14.75c., cash, New York, or 14.87½c., delivered, cash 30 days, it is reported that some small business has been done at 14.75c., delivered, cash 30 days, and it is further stated that second hands have made offers of 14.50c., cash, New York. It is safe to say, however, that copper is not freely offered at the last named price and not much could be had. Quotations to-day are 14.50c. to 14.62½c., cash, New York. The demand for copper products has been irregular and the only sustaining influence upon the market has been the excellent shipments abroad which total 25,800 tons this month. Lake copper continues nominal at 15c., with little to be had. Sales of choice brands have been made at 15.12½c. to 15.25c. The London quotations to-day are £64 5s. for spot and £64 15s. for futures.

Tin.—Practically the only day in the week on which there was business worthy of note was on February 18, when, at a late hour, the market took a sudden upward turn and about 200 tons was bought on the rise. On that day prices started at 39.25c. and closed at 39.40c. The activity of buyers was attributed to what was construed as the Administration's favorable attitude toward a quick decision on the proposed increase of railroad freight rates. Before the day was over sellers withdrew. On the following day there was but little inquiry and the situation was reversed, there being plenty of sellers, with consumers not coming forward. On that day, 20 tons of June tin was sold at 39.80c., which was a low price. Friday was dull and there was some depressing of prices by sellers. Saturday there were some sales of future delivery at low prices, but the quantity was not large and sellers were again leading the market. Yesterday buyers were timid but bought spot in a hand-to-mouth manner at around 38.60c. The quotation to-day is 38.12½c. The London quotations to-day are £173 10s. for spot and £175 10s. for futures, as against £179 for spot and £180 10s. for futures one week ago. Arrivals this month total 2985 tons and there is afloat 2970 tons.

Lead.—The market is dull at unchanged prices, namely, 4c., New York, and 3.87½c., St. Louis. Following the reduction to 4c. on February 11 independent sellers stayed out of the market for a time but later made their appearance again and there are now plenty of sellers and plenty of metal to be had, but consumers loaded up at the low price and have no disposition to buy. An interesting recent development is the exportation of some American lead, which was rather expected in view of the narrow margin between prices at London and New York. The export business has been done quietly and, while it is not questioned, it cannot be learned just how much was sent abroad. It is done, of course, at a concession on the New York price and it is believed that still more will go abroad.

Spelter.—The recent demand from the sheet mills has died out to a considerable extent and prices are shaded a few points, making the New York quotations 5.35c. to 5.40c. and those in St. Louis, 5.20c. to 5.25c.

Antimony.—Cookson's is a little easier at 7.20c. to 7.25c., but Hallett's is unchanged at 7c. to 7.25c. Chinese and Hungarian grades are about 6.50c., duty paid.

Old Metals.—The market is dull and featureless. Dealers' selling prices are as follows:

	Cents per lb.
Copper, heavy and crucible.....	14.25 to 14.50
Copper, heavy and wire.....	13.75 to 14.00
Copper, light and bottoms.....	12.75 to 13.00
Brass, heavy.....	9.00 to 9.25
Brass, light.....	7.75 to 8.00
Heavy machine composition.....	12.25 to 12.50
Clean brass turnings.....	8.75 to 9.00
Composition turnings.....	11.50 to 11.75
Lead, heavy.....	3.75
Lead, best.....	3.50
Zinc, scrap.....	4.25

Chicago

FEBRUARY 24.—The generally speculative market in tin suffered a slump during the week and quotations recovered only in part at the beginning of this week. Buying in other metals has been fairly active for spot shipment only. We quote as follows: Casting copper, 15c.; Lake copper, 15.25c. to 15.50c., for prompt shipment; small lots, $\frac{1}{4}$ c. to $\frac{1}{2}$ c. higher; pig tin, carloads, 40.75c.; small lots, 42.75c.; lead, desilverized, 4.10c., and corroding, 4.35c., for 50-ton lots; in carloads, $2\frac{1}{2}$ c. per 100 lb. higher; spelter, 5.30c.; Cookson's antimony, 9.50c.; other grades, 8c.; sheet zinc, \$7.25, f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. casks. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 12c.; copper bottoms, 11c.; copper clips, 11.50c.; red brass, 11.25c.; yellow brass, 8.50c.; lead pipe, 3.75c.; zinc, 3.75c.; pewter, No. 1, 25c.; tin-foil, 30c.; block tin pipe, 33c.

St. Louis

FEBRUARY 23.—Transactions have been reasonably satisfactory. The close to-day was as follows: Lead, 3.90c. to 3.92 $\frac{1}{2}$ c.; spelter, 5.30c. to 5.32 $\frac{1}{2}$ c.; tin, 39.35 to 39.60c.; Lake copper, 15.30c. to 15.40c.; electrolytic copper, 15.20c. to 15.25c.; Cookson's antimony, 7.60c. Continued bad weather had the effect of reducing the Joplin ore supply and this, with the higher price for spelter, advanced ore prices. The range was \$41 to \$43.50 for 60 per cent., with the top price \$46.50. The quotation of \$50 for lead ore, 80 per cent., was only fairly well held. We quote scrap as follows: Light brass, 5c.; heavy yellow brass, 7.50c.; heavy red brass and light copper, 9c.; heavy copper and copper wire, 9c.; zinc, 2.75c.; lead, 3c.; pewter, 22c.; tin-foil, 28c.; tea lead, 2.75c.

Iron and Industrial Stocks

NEW YORK, February 25, 1914.

The buoyancy of the stock market has been checked to some extent by the unfavorable turn in our relations with Mexico. Industrial stocks have made no important recessions, except the preferred stock of the J. I. Case Threshing Machine Company, in which there was a precipitate decline of about 10 points on the announcement of a bond issue of \$12,000,000, followed by some recovery due to reassuring statements. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal., com. 13 - 14 $\frac{1}{4}$	Pressed Stl., com. 43 $\frac{1}{2}$ - 45 $\frac{1}{2}$
Allis-Chal., pref. 48 - 49	Pressed Stl., pref. 104
Am. Can., com. 30 $\frac{1}{4}$ - 31 $\frac{1}{4}$	Ry. Spring, com. 28 - 32 $\frac{1}{2}$
Am. Can., pref. 92 - 93	Ry. Spring, pref. 99
Am. Car & Fdry., com. 51 - 52 $\frac{1}{4}$	Republic, com. 25 $\frac{1}{2}$ - 26 $\frac{1}{2}$
Am. Car & Fdry., pref. 116	Republic, pref. 89 - 89 $\frac{1}{2}$
Am. Loco., com. 34 $\frac{1}{4}$ - 35	Rumely Co., com. 12 - 14 $\frac{1}{2}$
Am. Loco., pref. 102	Rumely Co., pref. 28 - 33
Bald. Loco., com. 43 - 44 $\frac{1}{2}$	Sloss, com. 34 - 34 $\frac{1}{2}$
Bald. Loco., pref. 106 $\frac{1}{4}$ - 106 $\frac{1}{2}$	Pipe, pref. 48
Beth. Steel, com. 36 - 39	U. S. Steel, com. 65 $\frac{1}{4}$ - 66 $\frac{1}{2}$
Beth. Steel, pref. 76 $\frac{1}{4}$ - 79	U. S. Steel, pref. 109 $\frac{1}{2}$ - 110 $\frac{1}{2}$
Case (J. I.), pref. 82 - 89 $\frac{1}{2}$	Va. I. C. & Coke, 50 - 51
Colorado Fuel, 32 $\frac{1}{4}$ - 33 $\frac{1}{4}$	West'gh'se Elec. 70 $\frac{1}{4}$ - 71 $\frac{1}{2}$
Deere & Co., pref. 95 - 97	Chic. Pneu. Tool 58 $\frac{1}{4}$ - 59
General Electric, 148 $\frac{1}{4}$ - 149 $\frac{1}{4}$	Cambria Steel, 50 - 50 $\frac{1}{2}$
Gt. N. Ore Cert. 35 $\frac{1}{4}$ - 37 $\frac{1}{4}$	Lake Sup. Corp. 23 - 22 $\frac{1}{2}$
Int. Harv., com. 104 $\frac{1}{4}$ - 108 $\frac{1}{4}$	Pa. Steel, pref. 66
Int. Harv., pref. 117 $\frac{1}{2}$	Cruc. Steel, com. 15 $\frac{1}{2}$ - 16 $\frac{1}{2}$
Int. Harv. Corp., 104 $\frac{1}{4}$ - 107 $\frac{1}{4}$	Cruc. Steel, pref. 93 $\frac{1}{2}$ - 94
Int. Harv. Corp., pref. 117 $\frac{1}{2}$	Harb. Walk. Ref., com. 50 - 52
Int. Pump, pref. 24 - 26	La Belle Iron, com. 43 $\frac{1}{2}$ - 44 $\frac{1}{2}$
Lackawanna Steel, 37	
Nat. En. & St., com. 12 $\frac{1}{4}$ - 13	

Dividends Declared

The Wellman-Seaver-Morgan Company, 2 per cent. on the common stock, payable March 16. This is the first dividend on common stock declared since 1905.

The National Enameling & Stamping Company, regular dividend, 7 per cent. on the preferred stock, payable in four quarterly instalments of 1 $\frac{1}{4}$ per cent. each, on March 31, June 30, September 30 and December 31.

The New York Air Brake Company, regular quarterly, 1 $\frac{1}{2}$ per cent., payable March 20.

The Mergenthaler Linotype Company, regular quarterly, 2 $\frac{1}{2}$ per cent. and $\frac{1}{2}$ of 1 per cent. extra, payable March 31.

The Republic Iron & Steel Company, regular quarterly, 1 $\frac{1}{4}$ per cent. on the preferred stock, payable April 1.

The Taylor-Wharton Iron & Steel Company, semi-annual, 4 per cent. on the common stock, payable April 1. The annual report for the year ended December 31, 1913, shows an increase in the surplus of over \$100,000, with quick assets more than seven times the current liabilities.

The Moline Plow Company, regular quarterly, 1 $\frac{1}{4}$ per cent. on the first preferred and 1 $\frac{1}{2}$ per cent. on the second preferred stock, both payable March 2.

The Nova Scotia Steel & Coal Company, regular quarterly, 1 $\frac{1}{2}$ per cent. on the common and 2 per cent. on the preferred stock, both payable April 15.

The American Fork & Hoe Company, regular quarterly, 1 $\frac{1}{4}$ per cent. on the common stock, payable March 15.

Pressed Steel Car Company's Year

The fifteenth annual report of the Pressed Steel Car Company, covering the operations of the year ended December 31, 1913, shows that the gross sales were \$30,967,360, against \$19,019,403 for 1912 and the net profits after deducting \$393,643 for repairs and renewals were \$2,374,816, against \$970,343 for 1912. After deducting \$875,000 for the 7 per cent. preferred dividend, \$375,000 as a reserve for a 3 per cent. common dividend and \$180,000 for depreciation of plants, \$944,816 was added to surplus and undivided profits, now totaling \$8,405,000.

The following extracts are taken from President F. N. Hoffstot's remarks accompanying the report:

"While your company carries into next year quite a little less business than was on the books at the beginning of 1913, we feel confident if your customers, the railroads, secure such an increase in freight rates as will partly make up for the increased costs forced upon them, your company's business will be given quite an impetus, particularly as there has been less than 100,000 freight cars purchased in 1913 and it has been many years since the full estimated annual requirements for renewals—namely, over 250,000 cars—have been purchased.

"The passenger car department has continued to contribute to the earnings during the past year, and, while your plant was the first to build steel passenger cars, at no time has the output been large. Since it is quite probable, however, that the future will bring an increased demand for this class of equipment, your board of directors has authorized doubling the capacity at an expenditure of about \$500,000. Plans are well under way for the erection of buildings, and these improvements will not only increase the capacity, but will at the same time reduce the cost of the entire output of this department."

At the monthly meeting of the Pittsburgh section of the Association of Iron and Steel Electrical Engineers, held at the Seventh Avenue Hotel, Pittsburgh, Saturday evening, February 7, E. M. Hewlett, engineer switchboard department, General Electric Company, gave an interesting lecture on the control of apparatus to be used in operating the locks of the Panama Canal.

The sixth semi-annual meeting of the American Institute of Chemical Engineers will be held at Troy, N. Y., June 17 to 20.

By-Product Coke Oven Plant at Buffalo

A by-product coke oven plant is to be erected at Buffalo, N. Y., on a tract of 50 acres, located on the Hamburg turnpike, Smoke's Creek, the South Buffalo Railroad and the Pennsylvania Railroad, south of the Lackawanna Steel Company's plant. The company which is to build and operate the coke ovens is the Buffalo By-Product Coke Corporation. Among the directors of the new corporation are Warren A. Wilbur, South Bethlehem, Pa.; George B. Leighton, Boston; Frank B. Baird, president Buffalo Union Furnace Company, and John J. Albright, a Buffalo capitalist, through whose interests the company has secured the site.

The plant will have a capacity of 1200 tons of coke per day and will produce a large quantity of gas, ammonia, tar, etc. The gas product will be taken entirely by the Lackawanna Steel Company, to whose plant it can easily be piped. Because of increased operating capacity this company will be in need of more gas than it is now producing in its own coke ovens. In addition to the advance disposal of gas, the Buffalo By-Product Coke Corporation has made arrangements for the disposal of 800 tons of coke per day, while the remainder will be marketed through the Buffalo office of the M. A. Hanna & Co. interests. The plant will cost approximately \$2,000,000. The type of oven has not yet been definitely decided, but the equipment is to be of the most modern and improved character.

The intensive study of the field of the mechanical engineer is to be further extended by the American Society of Mechanical Engineers, as announcement is made of the early appointment of additional subcommittees for industries. Among the committees to be appointed, each committee to comprise men recognized as authorities in their subject, are the following: Metals and metallurgical machinery; foundry; protection of industrial workers; relations with metallurgists, and steam power and plant equipment.

The German and English ferromanganese producers have renewed their agreement for the sale of the alloy in Belgium, according to English trade papers. The price of the 80 per cent material has been fixed at from 230 to 237½ francs, depending on quantity. The previous agreed price stood at 250 fr. at the end of 1913. The German producers have allowed the English a minimum sale in Belgium of 6000 tons per year.

A Grand Rapids, Mich., dispatch says that a judgment for \$899,403 in favor of the Arctic Iron Company, of Negaunee, Mich., in its suit against the Cleveland-Cliffs Iron Company and William G. Mather, was rendered in the United States District Court in that city. The suit grew out of the transfer of iron ore property from the Arctic Iron Company to the Regent Mining Company.

In a recent issue of the National Bulletin published by the advertising department of the National Tube Company, Pittsburgh, is given a complete list in alphabetical form of the entire products, large and small, made by this company. The list embraces no less than 953 different items, and includes the smallest articles made by the company up to the largest sized pipe.

Lewis Levene & Sons, 18 Elizabeth street, Binghamp, N. Y., dealers in scrap metals and other old material, are now occupying a new building of reinforced concrete, 76 x 95 ft., three stories, equipped with an elevator. Cars can be loaded on a spur which connects with the tracks of the Delaware, Lackawanna & Western Railroad.

The Lima Locomotive Corporation, Lima, Ohio, has taken an order for 14 standard locomotives for the Delaware, Lackawanna & Western Railroad.

New Carnegie Warehouse at Boston

The Carnegie Steel Company, Pittsburgh, has secured an option on land in Allston, a suburb of Boston, on which it proposes to erect a large warehouse for the distribution of iron and steel products to the New England trade. This is contingent on the city allowing the company to run a railroad switch into the warehouse across one of the streets. The company now maintains warehouses in Pittsburgh, Cleveland, Baltimore, and Waverly, N. J. It also has a distributing warehouse at Galveston, Texas, which is operated by a company known as the Texas Carnegie Steel Association.

New Foundry Association Secretary

A. O. Backert, editor the Foundry, Cleveland, has accepted the appointment as secretary-treasurer of the American Foundrymen's Association, succeeding Dr. Richard Moldenke who recently resigned. The change will take effect when Dr. Moldenke completes his work on the current volume of the Transactions of the association.

The House Committee on Naval Affairs has decided that the pending naval appropriation bill will include two battleships of the dreadnought type, six destroyers, and eight submarines. The Secretary of the Navy will be directed to place the eight submarines provided for on the Pacific coast and to have them built on that coast if practicable. The problem regarding a Government armor plate factory will be solved either by a provision in the naval appropriation bill or a separate resolution authorizing a commission to investigate existing plants and inquire as to the cost of a Government establishment. The commission will be directed to report at the next session of Congress.

Six prizes, aggregating \$200, the first being \$100, were offered some weeks ago by the Niagara Machine & Tool Works, Buffalo, N. Y., for the best suggestions concerning new machines and tools for sheet metal working or for improvements upon existing machines. The suggestions have recently been canvassed by a committee, which has awarded the first prize to M. J. Tierney, Pittsfield, Mass. The other awards, in order, were made to William Thomas, Beatrice, Neb.; H. A. Bott, McCurtain, Oklahoma; E. Erickson, Jamestown, N. Y.; A. E. Palmer, La Crosse, Kansas, and C. H. Smith, Galt, Ontario.

The Modern Steel Structural Company, Waukesha, Wis., has undergone an important change in ownership. At the annual meeting, which was held at the company's offices last week, it developed that S. B. Harding and F. W. Harding, formerly president and vice-president, had sold their interest and had retired from the management. The directors elected the following new officers: C. J. McIntosh, president; J. T. Cheney, vice-president; G. W. Helmer, secretary; R. A. Raschig, treasurer; G. A. Haynes, chief engineer. The company will open a Chicago office.

The Cleveland Pressed Steel Company is being organized and will be incorporated with a capital stock of about \$30,000 to take over the business and equipment of the Thatcher-Rueter Company, 826 Champlain avenue, Cleveland, Ohio. The new company will occupy the same site and will manufacture sheet metal stampings, tools and special machinery. H. F. Rueter will be manager.

Since December 1, 1913, the electric furnace of the Noble Electric Steel Company, at Heroult, Cal., has produced 3000 tons of pig iron in a 60-day run. At present the furnace is closed down for the substitution of carbon and graphite electrodes by means of which a lessening of cost is expected.

The Hawley Down Draft Furnace Company, Easton, Pa., is installing three of its down draft smokeless furnaces in the Peace Centennial School at Montreal, Canada.

Pittsburgh and Valleys Business Notes

The McClintic-Marshall Company, Oliver Building, Pittsburgh, has completed its contracts for the erection of large lock gates at the Gatun and Miraflores locks and of spillway gates at the Gatun locks, Panama Canal. The lock gates were 65 x 79 ft., and the contracts involved about 57,000 tons of structural steel, nearly all furnished by the Jones & Laughlin Steel Company, Pittsburgh. The work has been accepted by the Government.

Furnace No. 2 of the Ohio works of the Carnegie Steel Company, Youngstown, Ohio, was blown in February 20. Five of the six stacks at this plant are now in blast, No. 2 being idle for relining and repairs.

All of the finishing mills of the Republic Iron & Steel Company in the Youngstown district, except the 20-in. bar mill, are now in operation. Atlantic furnace of the Republic Company, at New Castle, Pa., was put in blast February 20. No. 4 stack at Haselton is the only idle furnace of the company in the Youngstown district, and it is expected to resume this week. Its Hall furnace, a small stack at Sharon, Pa., is still idle.

In the case of the Youngstown Sheet & Tube Company and others against the Pittsburgh & Lake Erie Railroad Company, the Interstate Commerce Commission sanctioned as not being unreasonable the rate of 70c. per net ton on bituminous coal in carloads from the Pittsburgh coal district to the Youngstown or Valley district of eastern Ohio and western Pennsylvania.

The year 1913 was the most prosperous in the history of the Union Switch & Signal Company, Pittsburgh, according to the annual report for the year ended December 31, 1913, issued last week. The net income was \$1,704,792, against \$1,076,501 in 1912, and the surplus was \$971,505, against \$205,629 in the previous year. At the annual meeting March 10 the stockholders will vote on a resolution to increase the capital stock from \$5,000,000 to not exceeding \$10,000,000. This stock is to be distributed to present stockholders as a stock dividend of 33 1/3 per cent.

The Wheeling Metal & Mfg. Company, Wheeling, W. Va., maker of galvanized and formed roofing, will increase its authorized capital stock from \$300,000 to \$1,000,000. It contemplates making large additions to its capacity, and plans for these improvements are now being prepared and will shortly be taken up by the board of directors.

The report that the Akron Rubber Company, Akron, Ohio, will build a branch factory at Ellwood City, Pa., is not correct. The B. F. Goodrich Company states that this is one of the early corporate names of that company and is still held by it for the purpose of preventing its use by others. So far as known there is no Akron Rubber Company in existence, and the B. F. Goodrich Company has no plan in contemplation of building a branch factory at Ellwood City.

The Toronto Foundry & Machine Company, Toronto, Ohio, has taken over the Henderson Foundry & Machine Company, Toronto, and the Tri-State Foundry & Machine Company, New Cumberland, W. Va. The new company is capitalized at \$125,000. Part of the machinery of the New Cumberland plant will be moved to Toronto, but both plants will be operated. The stockholders of the new company are all residents of Toronto.

The Pittsburgh Steel Company, Pittsburgh, which three years ago abandoned its warehouse at Savannah and moved it to Brunswick, Ga., has discontinued the latter warehouse and has again leased a warehouse at Savannah, from which its wire nails and wire products will be distributed to the Southern trade.

The Pittsburgh Crucible Steel Company has purchased Georgetown Island in the Ohio River, opposite its plant at Midland, Pa., but the report that it will be used as a site for a steel works and for homes for its men is untrue. The company will use it as a dumping ground for slag and other refuse from its mills at Midland.

At a joint meeting of the Pittsburgh Section of the American Chemical Society and the Engineers' Society of Western Pennsylvania, held in Pittsburgh last week,

W. H. Blauvelt, Syracuse, N. Y., spoke on "By-Product Coke Ovens."

At the annual meeting of the Driggs-Seabury Ordnance Corporation, held at Sharon, Pa., last week, John Stevenson, Jr., was re-elected president; William Flinn, Pittsburgh, vice-president; S. A. Pratt, secretary, and Harry Myers, treasurer. The company is operating its plant nearly full.

J. T. Dillon, Titusville, Pa., states that the paragraph published in *The Iron Age* of last week to the effect that he had purchased the property of the Riverside Engine Company of Oil City and would remodel the plant and put it in operation is not correct. He merely purchased the plant for an estate.

P. T. Berg, formerly chief engineer of the Homestead works of the Carnegie Steel Company, is a visitor in Pittsburgh this week, introducing a new alloy for making steel, known as silico-manganese, made in Norway. It is designed to take the place of ferromanganese and ferrosilicon. It is said that four or five years ago unsuccessful attempts were made to sell this alloy to American steel makers.

The Steel Car Forge Company, Butler, Pa., has received orders for 32,000 car wheels, of which 24,000 will be used for equipping cars recently ordered by the Chesapeake & Ohio and 8000 for cars to be built for the Wabash.

In the first two weeks in February the Westinghouse Machine Company, East Pittsburgh, besides getting a large number of orders for smaller apparatus, secured several large turbine contracts. The most important were two for the Worcester Electric Light Company, Worcester, Mass., comprising one for 6000 and another for 7500 hp., and a 6000-hp. for the Power Construction Company, Uxbridge, Mass.

Sales agents of the General Fire Proofing Company, Youngstown, Ohio, are meeting in the offices of the company this week to talk over business plans for this year. Sessions will be held daily until Saturday and will conclude with a dinner in the new Hotel Ohio on Saturday evening.

The puddlers' strike at the plant of the A. M. Byers Company, Girard, Ohio, has officially been declared off by the Sons of Vulcan.

The Ohio Iron & Steel Company, Lowellville, Ohio, will reduce its capital stock from \$5,000,000 to \$2,000,000. The larger capital was authorized several years ago when the company contemplated building an open-hearth steel plant.

The National Roll & Foundry Company, Pittsburgh, has received an order from the United Steel Company, Canton, Ohio, for the erection of a 14 and 9 in. combination Belgian guide mill on which to roll vanadium steel. The mill is to have a number of new features in its construction.

The Standard Seamless Tube Company, Pittsburgh, which will build a new plant at Economy, Pa., will have four buildings, all practically under one roof. The sections are 160 x 480, 80 x 160, 50 x 260 and 50 x 80 ft. The McClintic-Marshall Company has the contract for their erection, involving about 800 tons of structural steel. Much equipment will be needed.

Alexander Glass, president Whitaker-Glessner Company, Wheeling, W. Va., states that the report that his company will build an open-hearth steel plant this year is untrue. The company has no plans for enlargements.

The Carbon Steel Company, Pittsburgh, maker of high grade open-hearth and special alloy steels, has opened an office in Detroit, Mich., with H. A. Finkenshaedt district sales agent in charge. The business in that district has heretofore been handled by E. W. Saunders, who has been made district sales agent for the company at Cleveland, Ohio.

The Inland Steel Company, Chicago, about half of whose sheet mills have been down for some time pending a change from steam to electric drive, has completed these alterations and the mills are this week running full. An accumulated tonnage of sheets is now on the books of this company.

Personal

James M. Swank, Philadelphia, recent vice-president and general manager of the American Iron and Steel Association, has given to the Cambria Library, Johnstown, Pa., his large collection of books in which are many volumes of great historical value. The gift was accepted at a recent meeting of the trustees of the library.

C. L. Miller, vice-president and general superintendent American Steel & Wire Company, 828 Frick Building, Pittsburgh, sailed from New York for Naples on February 24 on a four months' vacation tour across Europe.

The Engineering Society of Buffalo on Thursday evening, February 26, will be addressed by James Hartness, president American Society of Mechanical Engineers and president Jones & Lamson Machine Company, Springfield, Vt., on "The Human Factor."

C. H. Griffin, connected with the German works at Wessenling, Germany, of the Norton Company, Worcester, Mass., sailed for Europe February 10.

F. A. Bohm, of H. Dreyer, Berlin, Germany, machine tool dealer, sailed for home February 21, after a six weeks' stay in this country.

P. O. Geier, Cincinnati Milling Machine Company, Cincinnati, Ohio, returned February 17 from a European tour.

Charles H. Johnson, representative in Cologne, Germany, of the Gisholt Machine Company, Madison, Wis., left New York February 10 on his return to Cologne, after a short stay here.

M. A. Coolidge, Fitchburg Machine Works, Fitchburg, Mass., sailed for Europe February 21.

Carl H. L. Flintermann has been elected general manager of the Detroit Pressed Steel Company, Detroit, Mich.

Edgar A. Clarke, formerly assistant superintendent of the mechanical department of the Cambria Steel Company, Johnstown, Pa., has been appointed chief engineer, to succeed S. M. Marshall, recently resigned.

J. I. Andrews, general manager of sales of the American Sheet & Tin Plate Company, Frick Building, Pittsburgh, has returned from Florida, where he spent about two months for the benefit of his health.

J. H. Regan, assistant secretary of the Pressed Steel Car Company, Pittsburgh, has also been made assistant treasurer, with headquarters in New York.

Fletcher Collins, formerly with Banning, Cooper & Co., Ltd., Pittsburgh, is now Pittsburgh representative of the Evans Coal & Coke Company, Connellsville, Pa., with offices in room 912, Frick Building, Pittsburgh.

William D. Mainwaring, for 11 years chemist and metallurgical engineer at the Detroit plant of the Railway Steel Spring Company, has opened an office in the Rockefeller Building, Cleveland, Ohio, as production engineer. He was at one time connected with the open-hearth department of the Pencoyd plant of the American Bridge Company during the installation of the continuous process of steel manufacture.

J. Fred Hulse, secretary of the Sharon Iron & Metal Company, Sharon, Pa., has resigned and on March 1 will become assistant to C. V. Erdman, general manager of the Phillips Sheet & Tin Plate Company, Steubenville, Ohio.

Major Joseph T. Speer, chairman of the board of the Pittsburgh Valve, Foundry & Construction Company, Pittsburgh, gave his annual dinner to the company's officials, office employees and foremen at the Hotel Anderson, Pittsburgh, on the evening of February 24.

Edwin Loomis King, receiver for the Pratt & Cady Company, was given a loving cup at a dinner to him at the Hotel Bond, Hartford, Conn., Saturday evening, February 14. The gift was from the branch house managers and other employees in appreciation of his work in the past 18 months in the management of the company's affairs and to commemorate the second anniversary of his connection with the establishment. The evening was one of congratulation on the success-

ful adjustment of the company's difficulties. It is expected the business will be taken over by Bishop White, of West Hartford, and that Mr. King will remain with his old associates in another capacity than that of receiver.

Scott R. Hayes, vice-president of the Railway Steel Spring Company since its organization, has resigned to become assistant to the president of the New York Air Brake Company, effective March 1.

Obituary

Dr. ROBERT KENNEDY DUNCAN, director of industrial research of the University of Pittsburgh, died at his home in that city February 18. He was born in Brantford, Ontario, Can., November 1, 1868. He took his B. A. at the University of Toronto with first honors in physics and chemistry in 1892. In 1897 he graduated from Columbia University in chemistry, after being a fellow in chemistry in Clark University. He taught chemistry in high and preparatory schools until 1900, when he went abroad to study European methods, particularly German. He perfected and patented processes for procuring phosphorus, for making a low-melting-point glass and for decorating glass. He is the author of books on industrial chemistry and of articles in many magazines.

BENJAMIN ILLINGWORTH, a pioneer of the steel industry in New Jersey, died February 22 at his home in Jersey City, aged 93 years. He was born in Sheffield, England, where he learned the rudiments of the steel business. He came to America at the age of 25. In 1848 he became interested in the Adirondack Steel Works of Jersey City, and subsequently built steel works at Rockaway and Pompton Lakes, N. J. In 1862 he founded the Jersey City Steel Company, manufacturing tool steel, afterward owned by Benjamin Atha & Co. He retired 25 years ago.

WILLIAM STRANGWARD, president and general manager of the Forest City Foundry & Mfg. Company and of the Walworth Run Foundry Company, Cleveland, Ohio, died February 16, aged 66 years. He suffered a slight stroke of apoplexy early in January and had been confined to his house since that time. He had been active in the foundry industry in Cleveland for 24 years. With some associates he organized the Viaduct Foundry Company in 1881 and the Standard Foundry Company in 1888. In 1890 he and Charles F. Seelbach established the Forest City Foundry & Mfg. Company. In 1904 he and Mr. Seelbach purchased the Walworth Run Foundry Company.

Francis G. Frink, secretary of the Washington Iron Works, Seattle, Wash., announces that his company will immediately double the capacity of its Girod electric steel casting plant, recently completed. He states that within a few weeks after the successful installation of the new furnace the demand for logging and lumbering machinery involved castings far exceeding its capacity. The company expects to have the second furnace in operation within six months.

Union molders and core makers at Erie, Pa., have been notified that the foundry strike in that city will be declared off March 3, and union benefits will cease. It is said that the foundrymen will take back the men who can be given work, but the prospects are that not more than half the strikers will get employment on account of dull trade.

Witherbee, Sherman & Co., Inc., New York City, elected the following officers at the recent annual meeting: President, F. S. Witherbee; vice-president, E. A. S. Clarke; treasurer, W. C. Witherbee; secretary, L. W. Francis. The board of directors is composed of the above named, together with George C. Foote and Moses Taylor.

The Machinery Markets

Some important centers of the machine tool industry, both manufacturing and distributing, have experienced some betterment in business, while others equally important have felt no improvement and on the whole conditions may be said to be irregular. Some dealers in New York, where the railroads continue to hold off in buying, find business unimproved, while others note an increase in inquiry which is encouraging. In Cleveland the demand for machine tools has improved, fair sales having been made with little delay after the issuance of inquiry. Cincinnati has been irregular, with railroad and automobile shops buying sparingly, but with good export orders in hand and woodworking and electrical equipment holding up well. In Detroit there has been a steady demand for single machine tools, with some fair sales of groups of tools as well, while second-hand machinery shows a duller tendency. Chicago is interested in the working out of a great trade school to be founded with a fund created by George M. Pullman. In that city railroad business is still halted. New bookings are slowly but steadily increasing in Milwaukee and inquiries are promising. The Central South has been fairly active and while current business is mostly in small machinery, inquiries make the outlook good for the next sixty days. In St. Louis the aggregate of demand is on the increase and while it springs mostly from the cities, there is indication of better demand from outside territory. The volume of inquiry in Birmingham has been satisfactory and sales are picking up in several directions. In the Pacific Northwest machinery dealers have found improvement, the logging business is active and good business is expected from the execution of plans which have been months in forming. Big business is slow in developing in San Francisco, but a gradual improvement has been felt in the call for single tools and small groups.

New York

NEW YORK, February 25, 1914.

Sellers of machinery have experienced but little change in conditions and irregularity is the most prominent feature of the situation. Scattered inquiries for one or two machines have increased in number with some houses, while others find a falling off, rather than a betterment, and in few cases has inquiry resulted in sales. It is thought that some of this inquiry must come to an issue in the next few days and that February may turn out pretty well. Some firms say the month already has a better record than January, and that, judging from the number of inquiries, the outlook for March is brighter. Houses that deal to a great extent with the railroads find a better demand from them for various materials used in their shops and hope that it will be followed by at least a partial demand for the machinery that is known to be needed. There is enough railroad inquiry out to make of itself an excellent volume of business, but the railroads persist in holding off action on the purchase of shop equipment. It is considered too early to foretell just how railroad buying will be affected by the status of the freight rate cases, although some sellers are inclined to take a rather dubious view. In short, dealers in machine tools are hopefully expecting greater activity to come in the next few weeks, and their attitude is that of many other lines, among them hydraulic machinery, rubber working machinery, gears, transmission chains, handling equipment, etc.

The American Radiator Company, Buffalo, will enlarge its factory on Elmwood avenue, by the addition of a foundry, 79 x 126 ft., two-stories, brick and steel, and will enlarge its plant on Rano street by the erection of a building 76 x 200 ft., one story.

The Niagara Machine & Tool Company, Buffalo, is building an addition, 40 x 100 ft., one story, to its plant on Northland avenue.

The State of New York will erect a cold storage plant at Thiells, N. Y., from plans of the state architect, at a cost of \$45,000. Frank A. Vanderslip, 55 Wall street, New York City, is president of the board of managers.

The State of New York will build on the Niagara State Reservation, Niagara Falls, N. Y., a repair shop, storage building and tool house, from plans of the state architect.

The A. Schreiber Brewing Company, Buffalo, is taking bids for a brick, steel and concrete addition to its bottling plant on Fillmore avenue.

Plans are being prepared for an addition to be made to the power house of F. H. Brezee, Oneonta, N. Y.

The Ingle Corporation, Rochester, N. Y., has been incorporated with a capital stock of \$50,000, to engage

in business as mechanical engineer, tool maker and machinist. W. Glaeson, C. Schlegel and L. P. Willska are the incorporators.

The board of electric lighting commissioners, Jamestown, N. Y., is receiving bids for a return tubular boiler, two underfeed stokers with force draft equipment and two iron smokestacks.

The Benedict Mfg. Company, Syracuse, N. Y., is completing plans for the erection of an addition to its silverware factory.

The village of Northport, N. Y., is having plans prepared for the construction of a sewage disposal plant to cost about \$70,000.

The A. L. Swett Iron Works, Medina, N. Y., is in the market for a 5000-lb., 35-ft. span traveling crane, and a cupola to melt 15 to 25 tons per hour.

Kelly & Steinman, Deposit, N. Y., have filed incorporation papers with an authorized capital stock of \$60,000 to engage in the manufacture of cut glass ware. M. J. Kelly and A. F. and F. Steinman are the incorporators.

The board of trustees of the Municipal Gas Company, Albany, N. Y., has authorized the construction of a power plant, the estimated cost of which is \$150,000. N. J. Brady is president.

The Reuther Mfg. Company, Hamburg, N. Y., has been incorporated with a capital stock of \$50,000 to manufacture and deal in farm implements and machinery. S. F. Colvin, H. S. Smith and H. F. Waltzer, New York City, are the incorporators.

The Puritan Food Products Company, Fredonia, N. Y., has plans under way for an enlargement of its plant, which was only built last year at a cost of \$300,000.

W. B. Chant & Son, Port Jervis, N. Y., have been incorporated with a capital stock of \$60,000 to manufacture knit goods, textiles, etc. W. M., W. H. and M. E. Chant of Port Jervis are the incorporators.

The Broadalbin Knitting Company, Broadalbin, N. Y., is to increase its capital stock from \$150,000 to \$200,000 to provide for plant additions.

The General Ore Concentrating Company, Kerhonkson, N. Y., has been incorporated with a capital stock of \$40,000 for the purpose of milling, smelting and treating ores. P. S. Hill, H. S. Fluckear, New York City, and F. M. Van Wagonen, East Orange, N. J., are the incorporators.

The Hudson River Box Company, Cohoes, N. Y., is having plans prepared for a paper box factory to cost about \$40,000, which it will erect next spring. Louis Bourgeois is president.

The June Mfg. Company, Patchogue, N. Y., has been incorporated to manufacture non-slipping horse shoe appliances. Henry W. Paine, Reuben J. Krause, of Patchogue, and Adolph Hoffman, Medford, Conn., are the incorporators.

New England

BOSTON, MASS., February 24, 1914.

The weather latterly has been unpropitious. The entire territory is to a greater or less extent snow-bound. Train service, both passenger and freight, averages pretty poor, and mail service has suffered likewise. The holiday week end had its effect, as always, but it is somewhat significant that Washington's birthday was not generally a holiday in manufacturing departments of shops and factories, though the opportunity was one which would have been heartily seized upon by owners not many weeks ago.

Some of the machine tool people are still pretty dull. Foreign business is slightly better. The English trade is keeping up especially well. But the improvement is slow, though many users of machine tools are running full or nearly so. To employ a much used expression, business is still spotty.

The Boston Navy Yard is rejoicing because it has the contract for the naval supply ship which is estimated to cost about \$1,170,000. According to the present understanding a permanent building slip will be erected at a cost of \$150,000, with steel framework and electric traveling cranes, which, if true, means business for Boston dealers, in addition to that which the construction of the ship will entail.

The Connecticut hardware manufacturers appear very well satisfied. New Britain, the Hardware City as it is called, reports improved conditions. The factories could produce more, and apparently the general belief among the manufacturers is that they will be producing more before summer.

The Russell Mfg. Company, Greenfield, Mass., is occupying its new factory, and is about to place on the market a full line of screw plates and taps. The business is a new one, and has a plant with a full modern equipment. The building, arranged as the initial unit, is 80 x 120 ft., with an ell 32 x 36 ft.

The American Nut Lock Company, a new corporation, has established its headquarters at Waterville, Me., with offices at 142 Main street. For the present manufacturing will be carried on at a foundry in Rockland, Me.

The Standard Machinery Company, Providence, R. I., has removed its business to Auburn, in the city of Cranston. The company has had its new shops in process of construction for some months, and they were ready for occupancy, but it was not intended to make the transfer until spring. However, the Manufacturers' building, Providence, in which the works were located, was recently the scene of a serious fire, and the company's machinery was wet down, the water freezing. Therefore it was decided that the cheapest and best way was to move immediately. The new shops are most advantageously located, on the main line of the New York, New Haven & Hartford Railroad, and in a thriving industrial community, and afford the opportunity for a large increase in capacity, which the growing business requires.

The Rowbottom Machine Company, Waterbury, Conn., has brought out a universal cam milling machine of a new type, designed for the manufacture of cams of all kinds in general use, including the face, box, drum and side types. It has eight cutter speeds and eight changes of feed, and either work or cutter spindle can be run in either direction, independent of the other. The cutter spindle slide operates vertically, following the form of the master cam by its own weight. Means of adjustment, in combination with a micrometer dial, permits measurements to 1-1000th in. The work head has a lateral motion to and from the cutter, and this also has a micrometer dial for the accurate measurement of the depth of groove to be cut. The capacity is face cams to 28-in. diameter, box cams to 32 in. diameter, and barrel cams to 24 in. diameter and 11 in. throw.

The Atlantic Mills, Olneyville, R. I., will add two stories to a large section of one of its mills.

William E. Diehl has been made sales manager of the Corbin Screw Company division of the American Hardware Corporation, New Britain, Conn., succeeding

Clarence X. Earl, who has been made vice-president of the Hendee Mfg. Company, Springfield, Mass., manufacturer of motorcycles.

The great corporations of Connecticut in the metal lines are always expanding their resources and their works, and the last week accentuates their prosperity. The Stanley Works, New Britain, has just voted to increase its capital from \$2,000,000 to \$2,500,000. Landers, Frary & Clark, Inc., New Britain, has increased its capital stock from \$2,000,000 to \$4,000,000, and will distribute the added shares as a dividend, because to quote the announcement, "it is the opinion of directors that it is in accord with public policy as well as to the interest of its stockholders that its capitalization should not only represent the cash capital paid in but should include also a fair proportion of the surplus assets that have for many years been reinvested in the business." The Waterbury Clock Company, Waterbury, has doubled its capital, bringing it to \$4,000,000, and the Colonial Brass Company, New Haven, has increased from \$10,000 to \$50,000.

The prospect is good that the Pope Mfg. Company, Hartford, Conn., manufacturer of automobiles and motor trucks, will be reorganized on a substantial financial basis, and the business continued.

The Worcester Pressed Steel Company, Worcester, Mass., has taken out a building permit for its rolling mill, already mentioned, which will cost \$20,000.

The Brown Cotton Gin Company, New London, Conn., will erect an addition to its foundry.

Philadelphia

PHILADELPHIA, PA., February 23, 1914.

The J. R. Bunting Bedding Company, 234 South Second street, Philadelphia, has leased a factory in Pittsburgh, where it will manufacture its products. The machinery has been purchased. It will continue its business at Philadelphia. The new plant of the company will be used as a distributing point for the Mercereau Metal Bed Company, Jersey City, N. J. The latter company has leased a building at Toronto, Ont., where it will manufacture its line. Machinery is now being installed.

The T. A. Harris Company, 147 West Thompson street, Philadelphia, is erecting a boiler house at Hancock and Thompson streets, 50 x 75 ft., two stories.

Harshaw, Goodwin & Fuller, Cincinnati, Ohio, are building a factory at Wolf and Swanson streets. The specifications include a complete power house equipment. A. Raymond Raff, 1635 Thompson street, is the architect.

George W. Blabon Company, 34 North Fifth street, is erecting a brick and reinforced-concrete factory, five stories, to cost \$42,000. The William Steele & Sons Company, 1600 Arch street, is the contractor.

Peuchert & Wunder, 310 Chestnut street, are preparing plans for a factory at Front and Spruce streets, 50 x 100 ft., four stories.

The C. B. Porter Company, 117 Broad street, is rebuilding its factory, recently damaged by fire.

The William Steele & Sons Company, builder, has been awarded the contract for the erection of a group of factory buildings at Stenton avenue and Loudon street, Wayne Junction, for H. G. Fetterolf, carpet manufacturer.

The pumping station of the Manufacturers' Light & Heat Company, Waynesburg, Pa., was wrecked by an explosion on February 19. It was one of the largest and most complete gas pumping stations in the country.

Dr. S. C. Dixon, commissioner, Harrisburg, Pa., will receive bids until March 1 for constructing a water works system for Hamburg, Pa.

R. R. Wilson, engineer, Saltsburg, Pa., will receive bids until March 1 for constructing a water works system for Dayton, Pa.

William E. De Groot has the contract for the erection of an addition to the plant of the Bristol Patent Leather Company, Bristol, Pa.

The Twentieth Century Mfg. Company, Elk Lick, Pa., manufacturer of traction and portable engines,

etc., is building an addition to its shops at Boynton, 60 x 150 ft., 2½ stories, to be used for assembling, etc. It is in the market for several lathes, one shaper, one grinder, one welding plant, one gray-iron cupola, and one brass and metal furnace. Later on it intends to install a complete iron foundry. H. H. Lang is manager.

The International Boiler Works Company, East Stroudsburg, Pa., has increased its capital stock, to provide for additions to its works, for which it will require one 10-ton electric crane, 39-ft. span; one 5-ton electric crane, 36-ft. span, and one direct-current generator.

Rapid progress is being made on the erection of another addition to the plant of the Roaring Spring Blank Book Company, Altoona, Pa. A. L. Garver is general manager.

The Doylestown Agricultural Company, Doylestown, Pa., has taken steps to rebuild its agricultural implement factory at Ashland and Clinton streets.

The Adams Mfg. Company, Reading, will increase the equipment in its polishing and special hardware and pattern departments.

The American Radiator Company will make improvements to its factory, Titusville, Pa., the coming summer.

The Hempfield Foundry & Machine Company, Greensburg, Pa., has awarded the contract to the Lawrence Steel Construction Company for the erection of a new steel frame concrete building.

F. Thomas, Baltimore, Md., has completed plans for the first factory to be built fronting on the new Falls-way. It will be constructed for the Diez-Romer Brass Company.

Chicago

CHICAGO, ILL., February 23, 1914.

Local machinery and equipment houses are much interested in the crystallization of the plans of the trustees of the fund left by George M. Pullman for the founding of a trade school. The amount at the time of the bequest was \$1,200,000 and now approximates \$3,000,000. The school departments will include cabinet making, carpentry, pattern making, foundry and machine work and tool making. The plans for the building are now in preparation and construction will be started this spring. Frank O. Lowden is chairman of the board of trustees and L. G. Weld, principal of the school.

The amount of new building and plant extension is still under normal as reflected by building permit figures. For January, 1914, the total valuation of new building in Chicago was \$4,686,700 as compared with \$6,902,000 in January, 1913, a falling off of two and one-quarter millions. An improvement in the volume of industrial inquiry has been noted, however, in the past fortnight. An interesting purchase of Prentice lathes was recently made by an automobile manufacturer as the result of which the capacity of the tool builder will be well occupied for some time. Indications supplied by competitive trading in which concessions have been rather marked of late are that machine tool builders elsewhere are less fortunate as regards business on their books. Railroad buying of machinery is still hanging fire. The Chicago & Western Indiana and Lake Shore lists remain unclosed, while for the more recent inquiry of the Louisville & Nashville prices are still being received.

The Standard Screen Company, 1848 W. Fourteenth street, Chicago, has acquired the factory, 120 x 124 ft., at the corner of Hastings and Lincoln streets.

Plans for a new high school at Highland Park, Ill., are now being prepared by J. C. Llewellyn, 38 South Dearborn street, Chicago, include a manual training department.

Speyer Brothers, through W. D. Cowles, architect, 10 South LaSalle street, Chicago, is preparing to build a brick factory, 47 x 100 ft., two stories, to cost \$20,000.

The American Can Company, through its architect, C. J. Preis, has awarded the contract for the erection of a three-story factory, 184 x 282 ft., on Clybourn avenue, Chicago, at a cost of \$275,000.

The Pennsylvania Railroad, through D. H. Burnham & Co., Chicago, has taken out a building permit covering the erection of a one-story brick power house, 25 x 77 ft., to cost \$4,000.

Through Fritz Foltz & Son, architects, 8 South Dearborn street, Chicago, Col. H. A. DuPont is preparing to build a three-story brick factory, 96 x 100 ft., to cost \$30,000.

The Curtis Door & Sash Company, 2355 Blue Island avenue, Chicago, has undertaken the building of a four-story brick factory, 106 x 225 ft., to cost \$100,000.

The Economy Tank & Heater Company, Chicago, has been organized with a capital stock of \$50,000 to manufacture water tanks and heaters. The incorporators are Frank Larrabee, 4022 Carroll avenue, Joseph Ambruster and George W. Pearsall.

The Forty-seventh Street Garage, Chicago, has been incorporated with a capital stock of \$10,000, by C. W. Mogg, 140 South Dearborn street. Repair work will be handled extensively.

The Scarborough Company, Chicago, has been incorporated with a capital stock of \$100,000 to manufacture machinery. C. A. McKeand, 6547 Ellis avenue, S. A. Kenny and A. T. McGovern are the incorporators.

The city of Springfield, Ill., is receiving bids covering the installation of a generator for the pumping station. John S. Schnepf is mayor.

The Rockford Milling Machine Company, Rockford, Ill., has filed notice of an increase in its capital stock from \$50,000 to \$100,000.

The Rockford Lathe & Drill Company, Rockford, Ill., has increased its capital stock from \$50,000 to \$100,000.

The Simplex Ice Machine Company, Joliet, Ill., will build a plant in that city for the manufacture of refrigerating machinery.

The Excelsior Garage Company, Granville, Ill., has been incorporated with a capital stock of \$2500. In connection with the general garage the company will operate a repair shop. The incorporators include R. P. Cotie, L. H. Triplett and H. H. Cassabaum.

The Cyclone Fence Company, Waukegan, Ill., is maturing plans for starting a manufacturing operation at Pittsburgh, and plans have already progressed sufficiently to assure the beginning of work during the coming summer.

The factory of Altorfer Brothers Power Washing Machine Company, Roanoke, Ill., was almost entirely destroyed by fire. The damage is estimated at \$30,000.

The Arkansas Machine & Boiler Works, Stuttgart, Ark., has taken over the machine shops of Layne & Bowler.

The Crown Iron Works, Minneapolis, Minn., manufacturer of structural and ornamental iron, has issued stock to the amount of \$300,000 in anticipation of plant enlargements.

The Dart Mfg. Company, Waterloo, Iowa, builder of motor trucks, is moving into a new factory, 80 x 700 ft., at Elk Run, near Waterloo. The change will permit of a large increase in manufacturing capacity and will be accompanied by an investment of \$100,000 in the company by the Elk Run Land Site Company.

The Gibbons Machine & Foundry Company, East Twenty-fourth and Slade streets, Des Moines, Iowa, has been organized recently and will conduct a general foundry and machine business.

The city of Cuba, Ill., will receive bids until March 6 for the construction and equipment of a steel tank, pump house and engine for its waterworks plant. The Fuller-Coult Company, St. Louis, is in charge.

The Sanitary Stove Mfg. Company, Benton, Ill., has been incorporated, with a capital stock of \$175,000, by Charles A. Aiken, Jr., Moses Pulverman and David Schlesinger.

The Frankfort-Spencer Grain Company, Frankfort, Ill., has been incorporated, with a capital stock of \$15,000, by Emil O. Weber, Henry Lubring and John L. Schroeder, to equip an elevator, etc.

The Modern Chemical Company, Lawrenceville, Ill., has been incorporated, with a capital stock of \$15,000, by C. P. Danks, Charles Mahan, W. E. Faircher and others, to manufacture chemical products.

Milwaukee

MILWAUKEE, Wis., February 23, 1914.

Gradual improvement is noted, but the betterment is slow. Bookings are small and continue to be of the hand-to-mouth order. A redeeming feature is that inquiries received point to ultimate realization of long expected purchases which have been awaiting more propitious business conditions. Murmurings of slight labor troubles have disconcerted some manufacturers, but nothing serious is anticipated unless imported agitators make a success of their efforts to discredit employers, which seems unlikely. The boot and shoe industry is involved in a serious labor trouble, due to this cause. Payrolls are slowly being increased, especially in the pattern-making departments. Machine tool builders, as usual, make the most encouraging reports.

The plant of the Beaver Dam Malleable Iron Company, Beaver Dam, Wis., purchased recently at receiver's sale by Lawrence Fitch, Milwaukee, vice-president of the defunct company, is rapidly being reopened throughout, due to placing of renewal orders for tie plates and other railroad malleables by railroads which have depended on the Beaver Dam plant to fill most of their requirements. The bankruptcy proceedings were instituted on account of internal troubles rather than because of financial straits.

The Universal Machinery Company, 1916 St. Paul avenue, Milwaukee, manufacturer of internal combustion motors, trucks, tractors, etc., is planning the erection of a large addition which will double the size of the works. The addition is made necessary by the increased demand for small air-cooled gasoline engines for cyclecar purposes. E. C. Devlin, general manager, states he has booked orders for 10,000 of these motors within the last month and the plant is running night and day on this production and still cannot meet the demand. Work on the addition will be rushed as soon as weather conditions permit.

Alfred Goethel, 301-303 Fourth street, Milwaukee, manufacturer of blower systems, has been awarded the contract for a large installation in the plant of the D. W. Britton Cooperage Company, Green Bay, Wis. The system will be electrically operated.

The Aluminum Goods Company, Two Rivers, Wis., is about to award contracts for the construction of another large three-story addition for the buffing and finishing departments. The company is placing the finishing touches on the new rolling mill. A 500 hp. turbine with direct-connected generator is being installed in the new power plant and the old 250 hp. power installation will be used to drive the rolling mill. The remainder of the plant will be electrically driven by individual motors. The completion of the improvements will mean the doubling of the former output. The headquarters of the company are in Newark, N. J.

The board of water and light commissioners, Kaukauna, Wis., is contemplating extensive improvements to the power plant, including the installation of an electric pumping plant to replace the present steam pumping equipment. A new water gauge and recorder will be installed. The work will be done during July or August.

S. I. Norton, Kaukauna, Wis., manufacturing carriages and farm vehicles, has purchased the Appleton Steel Plow Works, Appleton, Wis., and will move the business to his shops in Kaukauna.

The Plymouth Foundry & Machine Company, Plymouth, Wis., which recently increased its capital stock from \$30,000 to \$65,000, is having plans prepared for a foundry, machine shop, etc.

The Harris Typewriter Company, Fond du Lac, Wis., has increased its output to 25 machines daily. It expects to make another increase about July 1. Julius Keller is chief engineer.

The regents of the University of Wisconsin, Madison, have authorized the establishment of a Mechanics' Institute and placed Prof. F. D. Crawshaw in charge of arrangements. M. E. McCaffrey is secretary of the board.

The Edward Stupecky Electric Company has been

organized at Manitowoc, Wis., by Edward Stupecky, Racine, Wis.; Leonard Zielsdorf, Erie, Pa., and Edward Warren, Manitowoc, Wis., to build and repair electric motors and machinery. A shop has been established at 1208 Washington street.

The Mineral Point Public Service Company, Mineral Point, Wis., operating an electric light, power and water plant, has commissioned Anton J. Bemis, 39 South LaSalle street, Chicago, Ill., to prepare plans and specifications for a new power house, 55 x 75 ft.; steel overhead bunkers, ash conveyor system and minor improvements. Provision is to be made for three 500 hp. boilers to be added at a later date. Bids will be taken by Mr. Bemis.

The Fairbanks-Morse Mfg. Company, Beloit, Wis., is completing a 192 x 224-ft. addition to its small gas engine shop, and an addition, 69 x 289 ft., to the erecting floor for large engines.

The Fond du Lac Implement Company, Fond du Lac, Wis., is considering the project of erecting a new foundry and factory building for the production of grain drills, seeders, etc. The company has just sold its present plant and site to the Soo Railway. A. H. Smith is president.

The board of education, Marinette, Wis., is taking preliminary steps toward the erection of a new high school building, with manual training department, to cost in the neighborhood of \$250,000. George Landgraf is superintendent of schools.

The Christensen Mfg. Company, Menominee, Mich., manufacturer of accounting registers and machines, will greatly increase its output at once. T. C. Christensen is president.

The D. F. Poyer Company, Menominee, Mich., manufacturer of motor trucks, plans to increase its manufacturing facilities.

The Dudley Tool Company, Menominee, Mich., has engaged in the manufacture of cyclecars, placing its 1914 output at 500 cars, all having been contracted for by a Chicago wholesale dealer. A small list of tools is being purchased, but most requirements have been filled. Harold F. Tidemen is in charge.

The Joseph Wodsdalek Machine Works, Algoma, Wis., is being enlarged and some new equipment installed for the manufacture of gasoline engines and power feed cutters. Nearly all new equipment has been ordered.

Detroit

DETROIT, MICH., February 23, 1914.

Somewhat better business was reported the past week. The demand for single tools was fairly steady and two local manufacturers purchased small groups of tools. New inquiries reported are featureless and are for single tools only. Manufacturers of tools and machinery are operating on even basis, plants generally are not being operated at capacity, but a fair run of orders are being booked. The second-hand machinery market is inclined toward dullness. There has been a falling off in the demand for power plant equipment. Increased activity is noted in building circles, the increase in industrial construction work being especially interesting.

The large factory building at the corner of Brooklyn avenue and Abbott street, Detroit, occupied jointly by the Michigan Safety Furnace Pipe Company, the Kennedy Machine Company and the Detroit Loose Leaf Specialty Company, was practically destroyed by fire February 19, entailing a loss of \$150,000. The entire equipment of the three companies, valued at \$100,000, was ruined. Information as to the resumption of activities is not yet available.

The Automatic Drill Chuck Company, Detroit, has been incorporated with a capital stock of \$25,000 to manufacture drill chucks and other tools. The incorporators are L. R. Martell, A. W. Sempliner and A. F. Marschner.

Candler & Oehring, Detroit, manufacturers of metal roofing, have begun the erection of a two-story addition to their plant.

The General Aluminum & Brass Mfg. Company, Detroit, has awarded contracts for the erection of a brick and steel factory building, one story, at Grand Boulevard and St. Aubin avenue. George W. Graves is the architect.

The Enterprise Electro Plating & Mfg. Company, Detroit, has been incorporated with a capital stock of \$5000. Frank W. Hyer and Charles G. Bennett are the principal incorporators.

The Cadillac Tool & Sales Company, Detroit, has been incorporated with a capital stock of \$5000 to manufacture and deal in mechanics' tools. Frank W. Sand, John A. Burbank and Albert J. Stocker are the incorporators.

The Alter Motor Car Company, Detroit, has been incorporated with a capital stock of \$10,000 to manufacture automobiles. The incorporators are Ross A. Skinner, Guy Hamilton and Clarence A. Alter.

Louis Kemper, architect, Detroit, is preparing plans for a brick and steel factory building, four stories, for the Banner Cigar Company.

The American Brass & Iron Company, Detroit, has increased its capital stock from \$30,000 to \$100,000.

At the annual meeting of the stockholders of the Eddy Paper Company, Three Rivers, Mich., it was voted to increase the capital stock to \$500,000. A new papermaking machine and other equipment involving an expenditure of \$150,000 will be installed at the company's factory at White Pigeon.

The Lansing Stamping & Tool Company, Lansing, Mich., has been organized with a capital stock of \$40,000, to manufacture stamping tools, dies and other machinery. The new company will take over the business of the Sanitary Iceless Packer Company, both of Lansing. J. F. Brigham is general manager.

The Boehme & Rauch Company, Monroe, Mich., manufacturer of boxes, etc., will erect a factory to have a floor space of 270,000 sq. ft. Its machinery requirements include one 124-in. six-cylinder board machine with 81 dryers, eight 2000-lb. beaters, one 600-hp. engine, one 300-hp. Corliss engine, one 100-hp. variable speed engine, one 5 to 10 ton electric traveling crane, one hand-power traveling crane and two elevators.

The Michigan Screw Company, Lansing, Mich., has increased its capital stock from \$100,000 to \$200,000.

The Challenge Roller Mills Company, Kinde, Mich., will erect and equip a modern flour mill to replace the structure recently destroyed by fire.

The Howell Machinery Company, Howell, Mich., has been organized to take over the business of the Parker-Spencer Mfg. Company, Lansing, and will manufacture friction pulleys and governors. H. N. Spencer is president and general manager.

The Peninsular Power Company, Iron River, Mich., will spend about \$80,000 in remodeling and enlarging its power plant this summer. The company will build a power house and install two units of 2000 hp. L. T. Sterling, assistant secretary, is in charge.

The Simons-Leedle Furnace Company, Marshall, Mich., has purchased the plant of the defunct New Process Steel Company, with the object of manufacturing its own castings.

Cleveland

CLEVELAND, OHIO, February 23, 1914.

The demand for machine tools has improved considerably in the past few days. Dealers report a satisfactory volume of business in lots ranging from single tools to four or five machines. The greater part of this business was placed with little delay by buyers after making inquiry. A fair volume of the orders coming out are for fairly high priced machinery. There is a good demand for boring mills. One dealer reports the sale of three large boring mills this month. Second hand machinery is in fairly good demand. The demand for small power plant equipment is holding up well.

The W. S. Ferguson Company, engineer, Cleveland, will shortly place contracts for the first unit of a new plant that will be erected by the Lennox Furnace Company, Marshalltown, Iowa. There will be three buildings, one an assembling shop, 120 x 500 ft., partly one

and partly two stories high, of brick, steel and concrete construction. The other buildings, which will be erected later, will include a foundry and another shop building.

The Cleveland-Akron Bag Company has placed contracts for the erection of a seven-story steel factory building on a site recently acquired on East Fortieth street in Cleveland.

The J. A. Palm Mfg. Company, Cleveland, has been incorporated by J. A. Palm and others, with a capital stock of \$10,000 to manufacture iron and steel products.

The Noble Air Pump Company, Cleveland, has been organized with a capital stock of \$25,000. A plant has been established at 6619 Wade Park avenue for the manufacture of automobile tire pumps and equipment is now being installed. Extensions to the present plant will be made in a short time. J. C. Noble is manager.

The City Machine Company, Cleveland, has been incorporated with a capital stock of \$30,000. The business of this concern has previously been conducted as a partnership. The company, in addition to its other lines, has commenced the manufacture of macaroni-making machinery. Its shop is now located at 480 Prospect avenue, N. W., but the company expects to build a plant on a new site within the next few months. The officers will be E. J. Kershaw, president, and E. F. Ruffini, secretary and treasurer.

A proposition for refinancing the Dean Electric Company, Elyria, Ohio, has been submitted by A. L. Garford of that city, who has made an offer to take over the plant. It will be acted upon at a meeting of the stock holders.

Bellefontaine, Ohio, has received bids for new power equipment including engines and boilers for the municipal lighting plant.

A new water works plant is planned for Wooster, Ohio, and engineers have been asked to submit plans and specifications.

The Henderson Foundry & Machine Company, Toronto, Ohio, has changed its name to the Toronto Foundry & Machine Company.

The City Council of Upper Sandusky, Ohio, has voted a bond issue of \$25,000 for the erection of a municipal lighting plant.

P. E. Hawkins and others have organized the Hawkins Cycle Car Company, Tiffin, Ohio, with a capital stock of \$50,000 to manufacture cycle cars.

Bids will be received until April 1 for constructing a water works for Junction City, Ohio, to cost about \$16,000. H. L. Maddocks, Newark, Ohio, is the engineer.

Cincinnati

CINCINNATI, OHIO, February 23, 1914.

Somewhat irregular reports are made by the different machine tool makers. Several have received export orders that will keep their plants busy for 30 days, or more; but domestic business is slow in materializing. The automobile manufacturers, as well as the railroads, are only buying single tools for replacement purposes. However, the inquiry for different machines is good, and a busy spring and summer season is anticipated by the majority of local manufacturers. The demand for both woodworking machinery and electrical equipment holds up remarkably well.

The Ubiko Milling Company, Cincinnati, has acquired an additional site adjoining its plant and is having plans prepared for a large addition. Power and transmission equipment will be required.

The Cincinnati Fireproof Door Company, Cincinnati, recently organized, will need equipment for its proposed factory on Harrison avenue.

The Automobile Equipment Company, Cincinnati, has been incorporated with a capital stock of \$100,000, and will conduct a general garage and repair shop at 215 East Fifth street. E. H. Maffey is an incorporator.

The Dayton Power & Light Company, Dayton, Ohio, contemplates making some additions to its power plant for which electrical equipment will be required.

The Apple Electric Company, Dayton, Ohio, expects to enlarge its plant at an early date. Only a small amount of equipment will be required. The company

manufactures spark plugs and other automobile specialties.

The Dayton Welding Company, Dayton, Ohio, has purchased the plant of the D. L. Bates Company, manufacturer of washing machines. Some extra equipment will be purchased later.

The Springfield Spring Company, Springfield, Ohio, has increased its capital stock from \$25,000 to \$60,000 for the purpose of purchasing the plant of the Owen Machine Tool Company. Additional equipment will be installed, including annealing furnaces.

The Troy Wagon Works Company, Troy, Ohio, contemplates making some additions to its plant for which woodworking machinery will be required.

Indianapolis

INDIANAPOLIS, IND., February 23, 1914.

The Vonnegut Machinery Company, Indianapolis, has been incorporated with a capital stock of \$100,000, to deal in machinery and factory supplies. The directors are Anton and Clemens Vonnegut and Louis Hollweg.

The United Ice Company, Indianapolis, has purchased a site for the plant on Harding street. Joseph C. Weber is president.

The Spencer Auto & Machine Company, Spencer, Ind., has been incorporated with a capital stock of \$5000, to do an auto repair business. The incorporators are George W. White, H. B. White and W. O. Call.

The Schafer Saddlery Company, Fort Wayne, Ind., has been incorporated with a capital stock of \$75,000, and will build an addition to double the capacity of its factory.

The Alpha Company, Fort Wayne, Ind., has been incorporated with a capital stock of \$100,000, to manufacture apparatus for measuring liquids. The directors are A. Bowser, T. Fooheu and G. C. O'Connell.

F. H. Walker and E. L. Walker are at the head of the Walker Starter Company, La Porte, Ind., which has been incorporated with a capital stock of \$20,000, to manufacture starting devices.

The Indiana Auto Supply Company, La Porte, Ind., has been incorporated with a capital stock of \$10,000, to manufacture and deal in auto supplies. The directors are A. E. Gaul, William Pelz and A. Lindgren.

The Orleans Artificial Ice Company, Orleans, Ind., has been incorporated with a capital stock of \$10,000, and the Orleans Electric Light & Power Company has been incorporated with a capital stock of \$35,000. The directors are E. M. Heise, P. Heise and A. Heise.

Frank C. Ball, Muncie, Ind., has purchased the Interstate Automobile Company of that city. The price paid was \$215,000. It is understood that the Ball Brothers Mfg. Company, which largely controls the fruit jar trade of the world, will operate the plant, making a low-priced car.

The Columbus Handle & Tool Company, Columbus, Ind., has increased its capital stock \$100,000. L. M. Flesh, Piqua, Ohio, has been elected president. C. M. Handley is secretary.

The Flint & Walling Company, Kendallville, Ind., furniture manufacturer, has increased its capital stock by issuing \$400,000 preferred.

The Central South

LOUISVILLE, KY., February 23, 1914.

The machinery market is in a fairly active condition. All the machinery and mill supply concerns are receiving numerous orders, and indications are that a better season of industrial activity is at hand. Prospects for improvement are good, many propositions being ready to be undertaken. Several large contracts, it is reported, will probably be closed within the next 60 days. Most of the business being done now is on small machinery. Manufacturers of boilers state that business in the South is good. Electrical equipment houses report that many sales are being made in this immediate vicinity. Power-plant and waterworks propositions have been of much help to the trade. Coal-mining and oil and gas well operations are also responsible for a number of orders.

The Merchants' Ice & Cold Storage Company, Louisville, is in the market for two hydraulic elevators. N. A. Hardin is general manager.

The Wade & Brothers' ice plant, Fulton, Ky., will increase its capacity to 40 tons a day. New machinery is now being purchased.

Fred M. Smith, general manager of the Kentucky Southwestern Electric Railway, Light & Power Company, Paducah, Ky., which is building an interurban line, has just returned from Europe and will consider equipment propositions.

The Illinois Central Railroad has announced that it will make Paducah, Ky., the storage point for all scrap accumulated on its Southern lines. It is probable that equipment for handling this in bins will be needed.

The Rogersville Knitting Mills, Rogersville, Tenn., has been organized with a capital stock of \$50,000 by J. O. Phillips, and others. A mill is to be built.

The Central Garage & Sales Company, Nashville, Tenn., has been reorganized. John A. Wilsdorf is general manager. A large repair shop will be established.

The Appalachian Mills, which has just taken over the Holston Mills, Knoxville, Tenn., wants bids before April 1 for new cotton spinning machinery, a 600-hp. steam plant and other equipment. The entire cost will be about \$100,000.

The Universal Milling Company's plant, Lebanon, Tenn., has been taken over by a company composed of J. J. Askew, and others. Changes are to be made in the plant, it is reported. E. B. Lawrence will continue as manager.

The electric light plant, Morehead, Ky., was destroyed by fire. It will be rebuilt immediately. The Mayor is in charge of the renewal.

The plant of the Knoxville Saw Mill Company, Knoxville, Tenn., which recently burned with a loss of \$30,000, is to be rebuilt.

The Mahannah Lumber Company, Memphis, Tenn., is planning to enlarge its bending mills. It manufactures automobile rims.

The Chattanooga Plow Company, Chattanooga, Tenn., has decided to change its power from steam to electricity and has contracted to use 300-hp. Motors will be purchased at once.

St. Louis

ST. LOUIS, MO., February 23, 1914.

The machine tool market the past week has been steadily improving. The demand for tools is increasing in the aggregate, but large lists are still few. Orders for single tools are to a very large extent coming from the more important industries, which are extending their equipment or replacing old machinery. While the heavier requirements are largely from the leading cities of the St. Louis trade territory, there is growing evidence that enterprises in the smaller localities will be seeking equipment shortly. Second-hand tools are selling fairly well. Collections are reasonably satisfactory and the financing of new enterprises is beginning to show some progress.

The St. Louis County Producers' Market Association, Clayton, Mo., which is to construct a market in St. Louis, will receive bids for power, refrigerating and similar equipment within thirty days. A. C. McKibbin, St. Louis, may be addressed.

The Irwin Automatic Signal Company, St. Louis, has been incorporated, with a capital stock of \$50,000, by Charles F. and L. H. Smith, and others, to manufacture safety appliances, signals, etc.

The Percival Auto Repair Company, St. Louis, has increased its capital for the purpose of adding to its repair shop equipment.

The Lingle & Lingle Bag Company, Clinton, Mo., has been incorporated, with a capital stock of \$15,000, by T. J., W. P. and E. R. Lingle, to equip a plant for the manufacture of bags, etc.

The Renken-Henley Grain & Lumber Company, Sweet Springs, Mo., has been incorporated, with a capital stock of \$30,000, by Herman Renken, B. F. Henley and R. L. Orear, to operate an elevator and a lumber mill.

The C. S. Bankard Machinery Company, Joplin, Mo.,

has been incorporated, with a capital stock of \$15,000, by C. S. Bankard, A. W. Thurman and M. I. Bankard, to deal in and manufacture machinery.

The Crystal Ice Company, Canton, Mo., has been incorporated, with a capital stock of \$15,000, by Charles F. Eckert, George L. Hatzler and Frank F. Payne, to equip and operate an artificial ice plant.

The Illinois Oil Company has been incorporated, with a capital stock of \$500,000, to do business at Centuria, Mo., utilizing about \$75,000 in its plant and operations.

The Cassville Marble & Lime Company, Cassville, Mo., has acquired more land and will build mills and install additional machinery at once.

The Marthasville Milling Company, Marthasville, Mo., which was reported incorporated, with a capital stock of \$12,000, by F. C. Scovel, O. F. Berg and William Armann, is reported to be seeking equipment.

The Ardmore Refining Company, Ardmore, Okla., has been incorporated, with a capital stock of \$35,000, by J. B. White, of Ardmore, and C. S. Alexander and W. C. Bristow, of Oklahoma City, to do an oil refining business and equip a plant.

The Moyers Logging Company, Moyers, Okla., has been incorporated, with a capital stock of \$75,000, by Henry Walker, H. C. Hopkins and C. M. Hopkins, to equip and do a general lumber business.

Bids will be received by the city of Shattuck, Okla., for pumps for its water works. A. F. Breunnecke, Gage, Okla., is in charge. Electrically driven equipment is wanted.

The city of Foraker, Okla., will expend about \$25,000 on a water-works plant. The mayor at present is in charge.

The city of Bristow, Okla., will expend about \$40,000 on a sewer system, including disposal plant. The Benham Engineering Company, Oklahoma City, Okla., is in charge.

The Criswell Mfg. Company, Muskogee, Okla., has been incorporated, with a capital stock of \$15,000, by J. M. Criswell, Muskogee, and W. J. Criswell, Haskeel, Okla., to equip a manufacturing plant.

Improvements in the water-works plant, Little Rock, Ark., to increase capacity, power, etc., at a cost of about \$435,000, are planned by the Arkansas Water Company, of which A. M. Lynn, Pittsburgh, Pa., is president.

The Arkansas Power Company, Little Rock, Ark., will, it is announced, expend about \$15,000 improving the electric light and power plant at Arkadelphia. H. C. Couch is president.

The Arkansas Hydroelectric Company, Little Rock, Ark., is reported as having plans for a 4-unit, 10,000-hp. hydroelectric plant to utilize power in the Little Red River. C. V. Smith is the engineer.

Guy F. Donohue, Vicksburg, Miss., is reported in the market for equipment for the manufacture of patented shaker grates.

The city of Tunica, Miss., is having plans prepared by Fairbanks & Co., New Orleans, La., for a water-works plant at a cost for equipment of about \$10,000.

The city of Gulfport, through the mayor, is in the market for a constant duty pump, electrically driven, direct connected, with 750 gal. per min. capacity against a head of 30 lb., 6-in. discharge, motor to be 220 volt, 3 phase, 60 cycle.

The board of commissioners, Vicksburg, Miss., has voted to adopt the authorized issue of bonds of \$400,000 to be used for a municipal water-works plant.

A lumber company, acting through P. A. Cazes, New Orleans, La., is reported in the market for a considerable amount of wood working and metal working equipment, the latter in connection with its machine shops. Lathes, threading machines, saws, bending rolls, hammers, blowers, punch presses, shears, drills, pile driver, and compressor are included.

The Southern States Alcohol Company's plant, New Orleans, La., has been burned with a loss of \$200,000 on buildings and equipment. Replacement plans are under consideration.

The city of Hammond, La., will spend \$18,000 on water-works equipment under the direction of T. R. Thomas, commissioner.

The Jacobs Candy Company, New Orleans, La., will improve and increase the equipment of its factory, adding larger machines, etc. Ice-making and cold-storage equipment is included in the plans.

The W. G. Ragley Lumber Company, Ragley, La., with postoffice at Ragley, Texas, will equip a circular and gang type mill at Fulton, La., including a 48-in. sawmill with automatic sorter, power-driven transfers and resorters, a central power station, including engines, boilers, etc., 108-in. edger, and other necessary equipment.

The Shreveport Ice & Brewing Company, Shreveport, La., will build a refrigerating plant and otherwise improve its ice-making equipment at a cost of about \$200,000. The Gilsonite Construction Company, St. Louis, has the work in hand.

Birmingham

BIRMINGHAM, ALA., February 23, 1914.

The increase in structural activity and in the building of small factories has begun to have an effect on the machinery and machine tool trades. There is a satisfactory volume of inquiry, with sales picking up in several directions. Small boilers and engines are in special demand. The volume of business is becoming larger with each week, but restoration of conditions existing the first half of last year is not expected for some time. The American Pipe & Casting Company, Birmingham, it is reported, intends to rearrange a portion of its plant in order to manufacture 16 ft. cast-iron pipe.

The Attalla Lime & Land Company, Attalla, Ala., has been incorporated with a capital stock of \$5000. It is proposed to install a plant to manufacture lime. W. F. Stowers is president and Wilburn Hill, secretary.

Birmingham Realty Company, Birmingham, Ala., is to build a cold storage plant.

Swift & Co., Mobile, Ala., will install a refrigerating plant.

A company has been formed at Guntersville, Ala., for the manufacture of tool handles and cotton mill shuttles. D. Isbell, Earl Bradford and C. G. Fennell are interested.

The Rome Chair Company, Rome, Ga., has been incorporated with a capital stock of \$10,000 to manufacture chairs. Thomas and Albert Fahey and J. H. Huhlman are the incorporators.

The Cooperative Fertilizer Company, Braselton, Ga., will establish a 100-ton fertilizer plant. J. B. Thompson, H. J. Lott and L. F. Sell, Hoschton, Ga., and others, are interested.

Texas

AUSTIN, TEXAS, February 21, 1914.

There has been a slow but satisfactory improvement in the machinery and tool trade the past week. Building activities are increasing with the beginning of warmer weather, and marked improvement is expected soon. There have been a number of municipal projects of varying importance announced during the week.

The commissioners court of Dallas County has ordered the erection of a power plant at Dallas to supply the new county jail and the court house with power and light at a cost of about \$25,000.

W. V. Tevin, Bartlett, is enlarging the Bartlett electric light plant and will soon install additional machinery.

The Citizens' Electric Light & Power Company, Gonzales, is building an auxiliary steam power plant.

Plans are being made by the board of managers of the State tuberculosis colony, Carlsbad, for improvements to cost \$43,350, including heating and electric plant to cost \$10,000, additions to the power house and other improvements. Charles W. Hobbs and George J. Bird are members of the board of managers.

The Texas Land & Development Company, owned by the Pearson Syndicate, will develop its lands in Hale County, near Plainview. Other landowners in that section are also planning to drill wells, and a large amount of irrigation machinery will be installed the coming year. S. DIESCHER & SONS.

Mechanical and Civil Engineers,

PITTSBURGH, PA.

The taxpayers of Pilot Point have voted \$14,000 of bonds for the construction of a waterworks plant and system.

H. E. Bickford is developing for irrigation a tract of 100,000 acres near Deming, N. M. Irrigation wells are being put down, with pumping machinery, etc. E. A. Baker is chief engineer.

San Francisco

SAN FRANCISCO, CAL., February 17, 1914.

Dealers note a gradual improvement in the demand for single tools and small groups, but business of a more important nature in metal working machinery is developing very slowly. Local foundries and machine shops have passed through a period of unusual depression, and so far note only slight improvement in current conditions, though the appearance of scattered inquiries in connection with large improvement works looks well for the future. Numerous rush orders have been received in the last few days for spare parts, minor repairs, etc. Quarries and gravel plants are resuming work on a large scale. Notwithstanding the effects of radical state legislation, orders are beginning to come out fairly well from miscellaneous manufacturing industries.

The Llewellyn Iron Works, Los Angeles, Cal., is constructing a plant at Torrance for the manufacture of structural steel, plates, tanks, elevators, general contracting machinery, etc. It will include a foundry for private and jobbing work. Considerable new machinery will be added.

The Parker Iron Works, San Bernardino, Cal., is building a foundry, 54 x 100 ft., of five to six tons of castings per hour capacity.

The Pullman car shop at Richmond, Cal., has been unusually busy this winter, and it is reported that the capacity will shortly be increased.

The Panama Pacific Exposition is taking bids on a large transfer table for handling cars from the harbor belt railroad.

The San Pedro Machine & Foundry Company has arranged to lease a waterfront site at Los Angeles harbor, and will start work shortly on a cupola and machine shop.

The city of Oakland has appropriated \$1200 for the purchase of a gasoline-electric generating set.

The Fox Plow Works has started a manufacturing shop at Sunnyvale, Cal. Its castings will be made by the Hendy Iron Works plant at that place.

The Pratt Building Material Company, Marysville, Cal., is in the market for machinery for the manufacture of concrete products.

Knight's Foundry and Machine Shop, Sutter Creek, Cal., has been taken over by Chas. H. Norton, L. Oettinger and D. V. Ramazzotti.

It is reported that the Pacific Oil Cloth & Linoleum Company, Huntington Beach, Cal., will enlarge its plant.

The Western Chemical Fire Pail Company, recently organized at Phoenix, Ariz., is preparing to engage in the manufacture of fire fighting apparatus.

The Pacific Northwest

SEATTLE, WASH., February 17, 1914.

Logging, the most important industry of this section, has been generally resumed after a shut-down of seven weeks. Within a week all the Puget Sound camps will be in full operation. Local dealers report considerable improvement in the market, and are apparently greatly encouraged with the outlook. Many large projects have been waiting for good weather, and the machinery dealers predict considerable business from plans prepared last fall. Collections are somewhat better, though not yet normal.

The Great Western Smelting & Refining Company, Seattle, has just moved to its new location at 1924 Ninth Avenue South and has trebled the capacity of the plant at a cost of about \$125,000.

The Self-Oiling Wheel & Bearing Company, Walla Walla, Wash., will erect a concrete and steel machine

shop and foundry at Thirteenth and Moore streets, at an estimated cost of \$10,000.

The Southwest Mfg. Company, Raymond, Wash., has awarded to the Sumner Iron Works, Everett, a contract for furnishing equipment for its new 10-machine shingle mill.

Daniel Huntington, city architect, Seattle, Wash., is preparing plans and specifications for the auxiliary steam plant to be built by the city at a cost of \$50,000.

The Northern Pacific Railway has completed plans for the erection of a creosoting plant at Auburn, Wash., and it is stated work will begin soon.

The Pacific Malted Food Company, Bellingham, Wash., has been incorporated, with a capital stock of \$100,000, by H. H. Bradlee and V. E. Bradlee, of Bellingham. It will at once construct a two-story factory for the manufacture of malted milk, tabloids, etc.

The Hardin Electric Light & Power Company, Hardin, Mont., has been incorporated with a capital stock of \$30,000. E. A. Cornwell is president and B. Blum is secretary. It is building a plant and is in the market for two 60-kw. 3-phase generators, one 100-hp. boiler, wire, insulators, etc.

A new power plant will be erected by the Glendive Heat, Light & Power Company, Glendive, Mont., two stories, to cost about \$75,000.

Eastern Canada

TORONTO, ONT., February 21, 1914.

The Sullivan Machinery Company, Ltd., Montreal, has been incorporated with a capital stock of \$5000 by Frederick K. Copeland and Samuel Seaver, Chicago, Ill.; John N. Black, Toronto, Ont., and others, to manufacture machinery, etc.

The Chapleau Wagon & Auto, Ltd., Montreal, has been incorporated with a capital stock of \$100,000 by Frederic H. Chapleau, Joseph A. Dufresne, and others, to manufacture automobiles, wagons, etc.

The Keystone Electric Company, Ltd., Hamilton, Ont., has been incorporated with a capital stock of \$75,000 by Henry A. Burbidge, John R. Marshall, and others, to manufacture automobiles, gas engines, steam engines, etc.

George Gale & Sons, Ltd., Waterville, Que., has been incorporated, with a capital stock of \$500,000 by Edgar R. Parkins, Alexander C. Calder, and others, of Montreal, to manufacture beds and cots of all kinds, etc.

The T. Latourelle & Sons, Ltd., Montreal, has been incorporated with a capital stock of \$100,000 by Tele-shore and Charles Latourelle, and others, to manufacture machinery, gas and electrical fixtures, etc.

The Canadian Baby Car Company, Ltd., Montreal, has been incorporated with a capital stock of \$300,000 by Napoleon Nantel, Joseph A. Mayette, and others, to manufacture automobiles, motor cycles, etc.

A. Macfarlane & Co., Ltd., Montreal, has been incorporated with a capital stock of \$100,000 by A. Macfarlane, James L. Miller, and others, to manufacture machinery, etc.

The Emergency Service, Ltd., Montreal, has been incorporated with a capital stock of \$50,000 by Charles A. Duclos, Edward G. T. Penny and others of Westmont, Que., to manufacture automobiles, motorcycles, etc.

The Abitibi Power & Paper Company, Ltd., Montreal, has been incorporated with a capital stock of \$7,000,000 by William H. Irving, Henry H. Davis, John R. Rumball and others to take over the Abitibi Pulp & Paper Company, Ltd., and to manufacture pulp wood, etc.

The Motor Finance Company, Ltd., Montreal, has been incorporated, with a capital stock of \$50,000, by Adolphe Kornbloom, New York, N. Y.; Edwin N. Todd, Edwin A. Mumford, secretary, and others of Montreal, to manufacture automobiles, engines, etc.

L. N. Senecal, of the board of commissioners, Montreal, Que., will receive bids until March 3 for constructing a pumping station, etc.

The Uxbridge Piano Company, Ltd., Uxbridge, Ont., has been incorporated, with a capital stock of \$40,000,

by Frederick B. Edmunds, Joseph Bone, and others, to manufacture pianos, organs, etc.

The Emmett Company, Ltd., Toronto, has been incorporated, with a capital stock of \$40,000, by Gordon B. Coyne, Norman J. Macdonald, and others, to manufacture lumber, doors, etc.

F. I. Fox, manager of the Toronto branch of the Ford Automobile Company, announces that the company will shortly erect a building 100 x 206 ft., five stories, at Dupont and Christie streets, Toronto, for the manufacture of automobiles.

A Canadian branch factory, 100 x 100 ft., three stories, is to be built at Windsor, Ont., by J. T. Wing & Co., Detroit, manufacturers of factory supplies.

The Standard Fitting & Valve Company, Guelph, Ont., has sold its factory to a Cleveland firm manufacturing carbon steel products.

The McLauthlin Elevators, Ltd., Montreal, has been incorporated, with a capital stock of \$50,000, by Eratus E. Howard, Jacob DeWitt, and others, to manufacture machinery.

The Hepworth Silica Pressed Brick Company, Owen Sound, Ont., will soon order the machinery for the plant near Hepworth, Ont. It will be one of the most modern and will have a capacity of 88,000 brick per day.

The Canadian Blaugas Company, Ltd., Montreal, has been incorporated, with a capital stock of \$300,000, by Frederick H. Markey, William G. Pugsley, George G. Hyde, and others, to manufacture gas for light, heat and power, and apparatus used in connection therewith.

T. L. Dates, general manager of the Doric Cement Company, Owen Sound, Ont., announces that steps have been taken for the reorganization of the company, which will mean a much larger plant and one of a much greater capacity. It is said that the coming summer the plant will be enlarged so as to be of sufficient capacity to turn out 3000 bbls. per day.

The Woodstock Concrete Machinery Company, Ltd., Woodstock, Ont., has been incorporated with a capital stock of \$150,000 by Robert G. Bickerton, David Scott, and others, to manufacture ore crushers and other machinery.

The Seeley Combination Axe & Tool Company, Ltd., Sault Ste. Marie, Ont., has been incorporated, with a capital stock of \$40,000, by William E. Seeley, George Carnfel, John G. Byrne and others, to manufacture axes, tools, tool holders, etc.

The E. E. Wallace Company, Ltd., Toronto, has been incorporated with a capital stock of \$40,000, by Harris E. Wallace, John A. Christilaw, and others, to manufacture dairy and farm products, etc.

The William English Canoe Company, Ltd., Peterborough, Ont., has been incorporated with a capital stock of \$40,000, by James English, Samuel W. English and others, to manufacture canoes, motor boats, etc.

Western Canada

WINNIPEG, MAN., February 20, 1914.

It is understood that the Austin Paper Company, Winnipeg, Man., is having plans prepared by the Albers Engineering Company, Kalamazoo, Mich., and Toronto, Ont., for the erection of a board mill, which will use flax straw for the making of board, and that construction will go ahead this spring.

Waring & Gillow, London, England, the great upholstery firm, will establish a plant at Victoria or Vancouver, B. C., according to an announcement made by J. Wentworth, its representative in this country.

Leitch Brothers, Oak Lake, Man., will erect a 3000 bbl. flour mill, a 300,000 bu. elevator, a 200 bag oatmeal plant and a cooperage and bag factory at Regina, Sask. The buildings to be erected will cost \$300,000.

The Carlyle Creamery Company, Medicine Hat, Alberta, according to W. M. Henderson, the manager, will erect a large plant as soon as building operations open in the spring. It will install a large pasteurizing plant fully equipped in every detail.

The Bertrand-Lockhart Lumber Company, Ltd., Port Arthur, Ont., has been incorporated with a capital stock of \$75,000 by Allen G. Seaman, Herbert A. Mc-

Kibbon, and others, to manufacture lumber and building material.

The Imperial Oil Company, Port Moody, B. C., has acquired a site on Burrard Inlet, near Port Moody, and will erect a \$500,000 oil refinery. Plans for the structure are completed, and it is expected work will start in the spring.

As a result of recent investigations regarding the possibilities of Vancouver, B. C., as a manufacturing center, J. S. MacDonald, of the Phoenix Mfg. Company, Eau Claire, Wis., is planning to establish there a factory similar to the Phoenix works. He also intends to operate a department for the production of gas-electric engines and complete tractors, log-haulers, etc.

Plans are being made at the office of the city engineer, Medicine Hat, Alta., for a high-tension electric distributing system and an addition to the electric generating plant.

Government Purchases

WASHINGTON, D. C., February 23, 1914.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington: Until March 10, schedule 6413, for steel cylinders for Brooklyn; schedule 6417, for steel dies for Norfolk; until March 17, schedule 6441, for a centrifugal pump for New London; schedule 6443, for duplex and simplex pump for Norfolk; until March 24, schedule 6439, for centrifugal pumps for Brooklyn; schedule 6432, for turbo-generator sets for Brooklyn.

Bids will be opened by the Bureau of Yards and Docks, Navy Department, Washington, on March 14 for one compressed-air locomotive, a three-stage charging compressor, pipe, etc., for stationary storage and charging stations, for Pearl Harbor, H. T.

The U. S. Engineer's Office, Dallas, Texas, will receive sealed proposals until March 20 for constructing and erecting four pairs of steel lock gates.

The Quartermaster's Department, U. S. Marine Corps, Philadelphia, will receive bids until March 4 for furnishing two water-tube boilers.

Requisitions have been received by the general purchasing officer of the Isthmian Canal Commission, Washington, for 20,000 ft. of plow-steel cable.

The following bids were received by the chief of the Bureau of Yards and Docks, Navy Department, Washington, D. C., February 14, for furnishing centrifugal pumps for delivery at the U. S. Navy Yards, Mare Island and Puget Sound:

Item 1, price for all pumps installed, complete; 1-A, do, using 2200 volt motors; 2, price for two pumps for fire and flushing service, complete, at Mare Island; 2-A, do, using 2200 volt motors; item 3, price for two heating system pumps installed at Puget Sound; item 4, price for each plant fulfilling in every respect the performance requirements of the specifications, but with such modifications as bidders may desire; item 4-A, using 2200 volt motors.

C. F. Braum & Company, San Francisco, Cal., item 1, \$13,686; 1-A, \$13,723; 2, \$7360; 2-A, \$7400; 3, \$6323.

De Laval Steam Turbine Company, Trenton, N. J., item 1-A, \$19,900 and \$19,300; 2-A, \$10,090 and \$9500; 3, \$10,051.

Perine Machine Company, South Seattle, Wash., item 3, \$7777.

John W. Danforth Company, Buffalo, N. Y., item 1, \$15,282; 2, \$8876; alternate bid, deduct \$375; item 3, \$7039.

Byron Jackson Iron Works, San Francisco, Cal., item 2, \$13,115; 2-A, add \$450; 3, \$11,195.

The Janesville Iron Works Company, New York City, item 4, Mare Island, \$9055; Puget Sound, \$7210; alternate, \$7482; Puget Sound.

The D'Olier Centrifugal Pump & Machine Company, Philadelphia, Pa., item 1-A, \$15,980; 2-A, \$8995; 3, \$7820.

The Alberger Pump & Condenser Company, New York City, item 1, \$13,683; 2, \$7360; 3, \$6323.

Charles C. Moore & Company, San Francisco, Cal., item 1-A, \$13,450; alternate, \$13,556; item 2-A, \$7277; item 3, \$6173; alternate, \$6269.

Abstract of bids for two 30-kw. 2200-244-488-volt transformers, adv. 271, Boise reclamation project, Idaho, bids opened at Los Angeles, Cal., Feb. 11, 1914:

B. F. Kierulff, Jr., & Co., Los Angeles, Cal., \$325.50; at Fort Wayne, Ind., in 14 days.

Pittsburgh Transformer Company, Pittsburgh, Pa., \$334; at Pittsburgh, Pa., in 15 days.

Moloney Electric Company, St. Louis, Mo., \$350; at St. Louis, Mo., in 20 days.

Wagner Electric Mfg. Company, St. Louis, Mo., \$360; at St. Louis, Mo., in 35 days.

Westinghouse Electric and Mfg. Company, Los Angeles, Cal., \$399.62; at East Pittsburgh, Pa., in 35 days.

General Electric Company, Los Angeles, Cal., \$350; at Pittsfield, Mass., in 10 days.

Allis-Chalmers Mfg. Company, Los Angeles, Cal., \$399; at East Norwood, Ohio, in 25 working days.

Crocker-Wheeler Company, Los Angeles, Cal., \$422.35; at Amper, N. J.

Trade Publications

Flat Turret Lathe.—Acme Machine Tool Company, Cincinnati, Ohio. Pamphlet. Concerned with a $3\frac{1}{4} \times 36$ in. combination flat turret lathe, which can be used for handling either bar or chucking work. Illustrated descriptions are given of the various parts of the tool, together with the accessories that are included with the bar equipment. Views of the lathe, equipped for chucking and bar work are given, together with lists of equipment and condensed specification tables. A sheet of erecting plans, when the tool is driven by a direct-connected motor or from a countershaft, are also included. An illustrated description of the lathe appeared in *The Iron Age*, November 6, 1913.

Autogenous Welding and Cutting Supplies.—Oxweld Acetylene Company, Thirty-sixth street and Jasper place, Chicago, Ill. Pamphlet. Pertains to a line of supplies for the oxy-acetylene process of welding and cutting metal. This includes fluxes, filling rods and wire of various kinds, goggles, cylinder holders, preheating outfits of different types, special cutting machines, hose and connections and a welding table. Practically all of the supplies are illustrated and briefly described.

Flexible Joints.—Barco Brass & Joint Company, Chicago, Ill. Leaflet. Calls attention to a flexible joint, designed for use in connection with iron pipes wherever a flexible conveyor is required for steam, air, oil, water or gases, as a substitute for rubber hose. A list of the different sizes of joints that can be supplied is given, together with views of the straight and 90-deg. types.

Universal Grinding Machine.—Greenfield Machine Company, Greenfield, Mass. Catalogue No. 5. Gives general description and specifications for a universal tool and cutter grinding machine. In addition to the general description, a number of pages are given over to brief illustrated descriptions of the performing of various operations and the use of the different attachments supplied. Illustrations of the work ground on this machine are included, together with front and rear views of a plain grinding machine for small work. Considerable information on the use of grinding wheels is also given.

Steel Sheet Piling.—Lackawanna Steel Company, Lackawanna, N. Y. Bulletin No. 106. Calls attention to the different styles of steel sheet piling manufactured and the various uses to which it has been put. Brief descriptions of the various operations are given and there are a number of drawings of the different types of piling and connections. Considerable useful information on the driving of these piles and the use of concrete in connection with them is included.

Lock Washers.—Reliance Mfg. Company, Massillon, Ohio. Catalogue. Size, $4\frac{1}{4} \times 7\frac{1}{4}$ in.; pages, 64. Treats of an extensive line of lock washers or nut locks which are made in a number of different types. These include the standard type, with or without a rib around the inner edge, and tail and clover leaf patterns. A view of each type of washer is presented with a table showing the bolt sizes for which it is made and the size of steel stock used, also the number, code word and price. Tables of machine screw sizes and decimal equivalents are given, together with a complete telegraph code.

Irrigation Pumps and Tractors.—Yuba Construction Company, 433 California street, San Francisco, Cal. Catalogue No. 22 and pamphlet. The catalogue relates to a line of belt-driven and direct-connected pumps. Illustrations of the two styles are included and the special constructional features are briefly mentioned. The pamphlet deals with a tractor for heavy road hauling, which is equipped with a ball thread.

Expansion Bolts.—Paine Company, 1316 Corn Exchange Bank Building, Chicago, Ill. Folder. Describes and illustrates a number of different kinds of expansion shells as a substitute for expansion bolts of the ordinary type. An illustrated description of this shell appeared in *The Iron Age*, April 10, 1913. A toggle bolt, for use in connection with the expansion shells for marble, slate, etc., is also featured.

Shovels.—Conneaut Shovel Company, Conneaut, Ohio. Catalogue. Relates to an extensive line of hand made shovels for ore, concrete, coal, track and blast furnace work, mining and ditching. All of the various styles are illustrated and briefly described with tables of the sizes in which they are made.

Elevator Safety Switch.—Cutler-Hammer Mfg. Company, Milwaukee, Wis. Pamphlet. Treats of a door safety switch for electric elevators which will not permit the elevator machine to be set in motion as long as any door to the shaft is open or unlocked.

Pig Iron.—Virginia Iron, Coal & Coke Company, Roanoke, Va. Calendar hanger measuring 29×60 in. The special feature of the hanger is three $12\frac{1}{2} \times 16\frac{1}{2}$ in. colored reproductions of the Radford and Crozer furnaces of the company and

a night cast at the Dora furnace. The calendar pad gives the dates for the present, preceding and succeeding months and a list of the different brands of pig iron made is given.

Bolts, Nuts, Rivets, Etc.—Russell, Burdall & Ward Bolt & Nut Company, Port Chester, N. Y. Catalogue. Illustrates the styles of bolts and nuts now most generally used for various purposes. In making up the catalogue a view of the type of bolt is given on one page with a table of the sizes in which it can be furnished on the facing one. Views are shown of various special nuts and bolts that can be supplied and a number of tables of weights of different shapes of steel and iron are included. A complete telegraph code for use in placing orders is given.

Trucks.—C. C. Helmbach, Olympia, Wash. Mailing card. Illustrates different types of trucks for handling various kinds of merchandise. In addition to the trucks shown, special styles can be built to order.

Meter Box.—Eagle Machine & Foundry Company, Hope, Ark. Pamphlet. Deals with a sectional meter box for inclosing a water meter and protecting it from damage. A description of the box is given, together with views of the way in which it can be installed and the various parts.

Machinery.—Platt Iron Works Company, Dayton, Ohio. Form No. 669. Lists in a convenient form the products of this company, which include centrifugal, turbine, simplex and duplex pumps; condensing apparatus, pumping engines, waterwheels, feed water heaters and purifiers and a complete line of oil mill machinery. Under the different classifications are included subheads of the various types.

Sheet Metal Specialties.—C. G. Folsom Mfg. Company, 545 South Scott street, South Bend, Ind. Folder. Calls attention to an extensive line of sheet metal specialties and structural steel and plate work. A partial list of the various lines manufactured are given and the work which the company is prepared to do in autogenous welding is also mentioned.

Castings.—South Bend Foundry Company, South Bend, Ind. Two pamphlets. Illustrate and describe briefly an extensive line of castings, including manhole covers of various sizes and shapes, brakeshoes, swage blocks, ventilators, furnace doors and grate bars.

Vertical Water Tube Boiler.—Wickes Boiler Company, Saginaw, Mich. Folder. Calls attention to the material used in the construction of these boilers, which permits them to stretch and change form before breaking. A view of the boiler and a brief description of its construction is given.

Saw Machinery.—R. Stowell, 1323 Whitney Central Building, New Orleans, La. Pamphlet. Relates to a line of saw machinery which includes two types of combined filing and setting machines, equipped for either belt or motor drive, and a bracing machine for use in connection with narrow band saws. All of these are illustrated and briefly described and in connection with the filing and setting machines, tables of brief specifications of the different sizes in which they can be supplied are given.

Railroad Ties and Joints.—Louis Blessing, 105 Clinton street, Jackson, Mich. Set of circulars. Treat of a concrete railroad tie and a rail joint. In the tie the reinforcement is formed to support each rail at the bottom of the tie and the central portion is raised to support the upper part of the tie. The rail joint consists of a plate that rests on the bottom flanges on the outside of the rails with the top edge slightly below the head. Views of both the tie and the joint are given, together with a brief description of their construction and use.

Trucks.—Spicer Mfg. Company, South Broadway, New Philadelphia, Ohio. Catalogue No. 13. Pertains to a line of trucks for shop and factory use, all of which are illustrated and briefly described. Some of the special trucks shown include ones for tin plate, heavy metals, sheet lead, iron and steel, etc. Mention is also made of adjustable wire reel, nail cleaning barrels, a sawdust separator and grinding machines.

Drinking Fountain.—Smith System Heating Company, 821 Washington avenue, S. E., Minneapolis, Minn. Form I. Describes and illustrates a bubbler fountain for use as a substitute for the ordinary common drinking cup. The particular advantages claimed for this fountain are that the water supply is kept clean and cool, fresh water is provided for each person and the danger of drinking from a dirty cup is done away with.

Air Washing.—American Blower Company, Detroit, Mich. Bulletin No. 23, Series 1. Deals with the washing or purifying of air used for ventilating buildings. A description of the company's standard scrubber type of purifier in which the air is sprayed with water supplied from a centrifugal pump and passed through a series of plates is given together with a halftone engraving of the apparatus and outline drawings. Brief specification tables for the washer which can be supplied in capacities ranging from 5700 to 10,600 cu. ft. per min. are included.



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